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DIGITAL DICTIONARIES AND VOCABULARY-BUILDING APPLICATIONS AS DETERMINANTS OF READING FLUENCY: A MULTI-CONTEXTUAL QUANTITATIVE ANALYSIS

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Abstract
The fact that digital technologies are developed at a fairly rapid pace has changed how the learner was able to utilize written language and that digital dictionary and vocabulary apps can now be listed among the most popular tools used in the contemporary post-secondary education. This paper will discuss the influence of these tools on reading fluency among university students and how digital lexicographical tools can influence vocabulary learning, reading comprehension, motivation and cognitive reading experience. The data were also collected by using the quantitative approach to survey and the target group worked upon was undergraduate and graduate students of Air University Multan Campus and other students. The outcomes suggest that the perceived general usefulness of online dictionaries and vocabulary utilization were helpful in facilitating the rapid access to dictionary definitions of words, vocabulary-related anxiety, and confidence to read diverse texts. However, there is another acute tension in the middle of the application of digital tools that the study, too, moves the meaning of an unknown word when solving a lexical ambiguity problem that can ruin the reading process and provoke cognitive overload not allowing reading comprehension in the moment. In terms of Cognitive Load Theory, this paradox could be viewed as not only a possibility of crafting digital tools but also as significant. It appears that vocabulary support tools integrated into reading interface are more smoothly helpful, as compared to the ones the learners would have to switch between different applications. The paper provides the perspectives on motivational and emotional factors of using digital tools as well, and it also concludes that a lower level of frustration and a higher level of confidence can be as educationally salient as purely cognitive gains. The implication of educational technology design, institutional policy, and classroom execution is suggested and suggested to apply more purposeful attempts to include digital vocabulary instruments into the academic reading course.

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Keywords: *digital dictionaries; vocabulary applications; reading fluency; cognitive load; mobile-assisted language learning; higher education; survey research*

1. Introduction

Among the most discussed issues of modern education, the correlation of digital technology with language learning has been revealed. With the growing technological mediated academic landscape at universities, references to written language have been replaced by tools like mobile applications, web dictionaries, and AI-supported platforms instead of the traditional paper-based ones. At the center of this change is reading fluency that has long been considered the cornerstone of academic achievement. The decisions about whether to resolve uncertainty in the mid-sentence (ranging from skip, infer, or use a digital tool) are significant to comprehension, confidence and ultimately reading development when faced by a student with an unfamiliar word.

1.1 Background of the Study

The practice of literacy throughout the world is evolving because digital technologies are altering the way people can access linguistic data. The transfer is most significant in EFL and EAP conditions, where reading requires high cognitive load on students, and the English-language-learning online market already is set to gain about USD 10.02 billion in 2025. In the Science of Reading paradigm, fluency is what allows reading words without focusing on each one individually and instead understanding them at a higher altitude (Alharbi, 2021) What mobile based language learning applications like U-Dictionary, Memrise and Baicizhan can now offer is instant definition and feedback (Rasyidah, Triana, and Rizky, 2025) replacing printed dictionaries and patient Although such tools have these advantages, it is not yet clear whether they really enhance reading fluency or are associated with new cognitive costs. According to (Mekheimer, 2018), pop-up dictionaries took the shortest time to find a word but were not used as often as the other types, whereas printed dictionaries required more mental effort, so there was no unequivocal simple linkage between the design of the tool and the result of the reading. More current studies have been found to be inconclusive: (Rasyidah, Triana, and Rizky, 2025) found superior reading performance using U-Dictionary ($p<0.05$) due to interactivity and instant feedback; 89% of the surveyed students in Indonesia contained in (Hidayah, et al., 2025) found better vocabulary learning faster using digital platforms. These gains however can be compensated by the split-attention effect in Cognitive Load Theory where alternate work between text and tool increases extraneous cognitive load. This dilemma of advantage and expense is not extensively investigated in Pakistani tertiary education.

1.2 Rational of the Study

Although the digital dictionaries and vocabulary tools are often used among university students, empirical research into their quantifiable impact on reading fluency in Pakistani tertiary and higher education is still uncommon. Findings The positive relationships between the applied app and vocabulary gains are established by international findings (primarily in Indonesia, Saudi Arabia and North America), but it is not clear how these findings can be generalised to student populations, institutional settings and technology platforms. The benefits (vocabulary growth, faster reading, motivation) and difficulties (attentional disruption, cognitive load and excessive dependence on technological mediation) are also over-emphasized and under-reported in the existing literature. Modern students are digital natives (Prensky, 2001), whose resources are not available or appealing in print, but the pedagogical implications of this change how fluency is learned, assessed, and encouraged in technology-mediated situations, are under-investigated. They need to make a choice between which tools to prescribe, which tools to incorporate into curricula and which outcomes to

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focus on, yet do not generally have institution-specific evidence, resulting in a choice between off-the-cuff adoption or rejection of the tools.

1.3 Research Gap

Digital dictionaries and vocabulary applications are highly adopted by Pakistani university students, but there is little empirical data on their quantifiable impact on reading fluency in this tertiary setting. The previous studies indicate significant correlates of the apps use and vocabulary usage that are, mostly, of Indonesian, Saudi, and North-American origin, and how much they apply to Pakistani students, organizations and technology platforms is still unclear. Institutional decisions need a local empirical basis based on survey-based data of the student population of Air University and other local institutes.

1.4 Research Objectives

The following objectives are the ones pursued in the study:

1. To capture the current trends in the use of digital dictionaries and vocabulary apps by Air University students, such as the tools that are used most, the frequency of such use, and the devices most utilized.
2. Evaluate the perceived impact of the said tools on vocabulary learning, reading fluency, and reading comprehension on a 5-point Likert scale.
3. To discover what cognitive and behavioral difficulties students face when working with digital tools during the reading process and relate it to Cognitive Load Theory.
4. To explore the variations in results in terms of proficiency levels, device types, and usage patterns.

1.5 Research Questions

This study will focus on the following questions:

1. What are the current use and adoption rates of digital dictionaries and vocabulary apps among the students of universities, and what tools are the most popular ones?
2. To what extent do students think digital dictionaries and vocabulary applications have an influence on reading fluency, vocabulary acquisition, and reading comprehension?
3. What are the cognitive and behavioral impediments to students in their use of digital tools in reading, and how they are connected to the Cognitive Load Theory?

1.6 Significance of the Study

The research is important on three levels. In theory, it adds empirical data to arguments about digital tool and reading fluency using Cognitive Load Theory as well as Simple View of Reading to explain how technology influences literacy exults that validate or challenge theoretical forecasts concerning tool design, cognitive capacity, and reading effects. In practice, research is used in decision-making by teachers, administrators and developers of educational technologies about what tools to choose, how they will be introduced into the classroom, and how the lesson will be structured; research challenges provide practical advice on how to develop less disruptive interfaces. At an institutional level, the research provides local empirical evidence by students of Air University to inform policy, which adds evidence that is directly relevant to higher education institutions in Pakistan and South Asia that are dealing with the integration of technology.

2. Literature Review

The literature review is divided into three parts: Theoretical Foundations, Review of Empirical Studies and the Conceptual Framework. Thanks to this structure, the cognitive, behavioral, and pedagogical factors that affect reading fluency in the digital age can be thoroughly analyzed.

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2.1 Digital Dictionaries and Vocabulary Applications: An Overview

The introduction of online dictionaries, and vocabulary applications is among the greatest changes to lexicographical practice and language-learning assistance. To comprehend their effects on reading fluency, we need to get straight in our minds what these aids are, how they developed, what they are now and how they are superior to the print antecedents. Electronic lexicography came into existence in the 1980s with portable electronic dictionaries which enabled typed word search instead of flicking through printed page, frequently found in East Asian EFL education. In the late 1990s, CD-ROM dictionaries introduced audio specifications, illustrative sentences as well as etymologies to desktop computers. The access to Web platforms like the Merriam-Webster Online and the Cambridge Dictionary Online was democratized by broadband in the early 2000s (Nesi, 2014). The introduction of mass smartphone usage, circa 2008, and the App Store and Google Play, subsequently opened the door to a new category of vocabulary-learning applications that focus on learning a language, as opposed to mere reference that glues dictionary entries with spaced-repetition algorithms, gamified progress tracking and social interactions with devices students carry in their pockets.

2.1.1 Types of Digital Dictionaries and Vocabulary Applications

Modern computerized vocabulary devices can be divided into three categories. The direct electronic successors of print dictionaries are digital reference dictionaries (e.g., Merriam-Webster, Oxford Learner, Google Translate), which have definitions, pronunciations, and examples on-demand, and usually are used reactively. Applications used in vocabulary learning (e.g., Duolingo, Memrise, Quizlet, Anki) are designed to produce long-lasting memory by having students engage in structured exercises based on a spaced-repetition algorithm, as part of a dedicated-study activity. All-in-one reading-and-vocabulary tools (e.g., U-Dictionary, LingQ, vocabulary builder in Kindle) feature simultaneous dual skills, i.e., learning vocabulary by looking words up in live text and instant translation, as well as adding words to personal vocabulary lists to review them later. Such a hybrid form is especially applicable in reading fluency, so as to reduce the interference of lookup to aid lexical growth.

2.1.2 Current Market and Adoption Landscape

There is now widespread uptake in the higher education. Digital English-language-learning market is predicted to grow to a rudely USD 10.02 billion around the year 2025 and the growth will be primarily fueled by mobile applications. Duolingo solely boasts more than half a billion registered users as of 2024 and dictionary apps like U-Dictionary have been downloaded in equivalent numbers. The lexicon assistance provided by smartphones is now the default answer to lexical doubt to the vast majority of university students, replacing the use of print dictionaries and reference to instructors such that the actual effect of these applications on fluent performance has become a research and pragmatic concern.

2.2 Theoretical Framework

The digital tool effect on reading fluency lies in the various intersecting cognitive theories that assert how human beings decode linguistic symbols and develop neural circuitry in the long terms to support literacy.

2.2.1 The Simple View of Reading

This model postulates that reading comprehension is the multiplicative product(decoding skills) of language comprehension ability(s) (Alamri and Hakami, 2022) In this theory, reading fluency is the mechanism through which the decoding process is no longer at the expense of effortful and conscious process but rather an automatic recognition of the

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relationship between letter sequences, sound patterns, and word meaning that is known as an orthographic mapping Digital vocabulary apps enhance orthographic mapping, accelerating the process via multiple, reinforcing exposures that visual, auditory, and interactive modalities establish to the words. As (Rasyidah, Triana, and Rizky, 2025) have shown, the multi-modal exposure method provides statistically significant effect on reading, and the interactive aspects seem to have a significant role in engagement and retention.

2.2.2 Cognitive Load Theory and the Split-Attention Effect

Cognitive Load Theory (CLT) offers important insight to assessing digital lexicographical tools design. Three kinds of cognitive loads are described as intrinsic (complexity of the task), germane (effort dedicated to schema construction), and extraneous (irrelevant information due to poor design) as proposed by CLT (Sweller, 1988). Lookups in traditional dictionaries can have a large extraneous cognitive burden due to the split-attention effect, in which a student must alternate attention between a physical book and a text. This load is reduced by using digitals, especially pop-up dictionaries, which offer the immediate information on lexicon, and the working memory mainly stays focused on text decoding and internalization.

2.2.3 The Hooked Model and Habit Formation

Many contemporary vocabulary applications are based on the Hooked Model as a behavioral scheme established by (Eyal, 2014), to maintain the learner attention.This model has four stages Trigger, Action, Variable Reward and Investment.

- Trigger: The inner sensation of a lack of knowledge about a word or a piece of application notification.
- Action: Clicking on a word to gain a definition.
- Variable Reward: Contentedness of immediate insightfulness or accomplishment of a streak in a gamified setting.
- Investment: Saving a word to personal dictionary, which makes the tool more useful in order to use it again? Such regular repetition into this loop converts effortful look-up into an automatic study, thus creating permanent lexical storage and reading fluency.

2.2.4 The Lexical Quality Hypothesis

In the Lexical Quality Hypothesis (Perfetti and Hart, 2002) it is claimed that the reading comprehension is constrained by the quality of representations that a reader holds of words. Good representations combine orthographic, phonological and semantics allowing automatic recognition of the qualities which underlie fluent reading. In the case of digital the tools, this would mean that applications with rich features that provide pronunciation, morphology, collocations, and example sentences in a context yield higher learning outcomes than plain lookup dictionaries. This hypothesis is specifically applicable in explaining the difference between the perceived quick acquisition and lower reported long-term retention, as explained in the subsequent results sections below.

2.3 Review of the Empirical Studies

According to empirical research of 2018-2025, a variety of influence of digital dictionaries and vocabulary applications on learners of various educational levels is observed in education. The twelve studies reviewed are arranged into four themes: vocabulary acquisition and retention, reading fluency, types of electronic dictionary and their efficiency, and difficulties with using digital tools of literacy. Basing the empirical review on the studies related to the acquisition research, (Rasyidah, Triana, and Rizky, 2025) applied the quasi

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experimental pre- post -test methodology in order to investigate the impact of U-Dict on reading performance of senior high school learners. Interactive features such as instant feedback, audio pronunciation and context examples exhibited significant improvement in the experimental group ($p<0.05$) because they are viewed to have aided faster orthographic mapping as anticipated by the SVR. Correspondingly, (Alisoy & Sadigzade, 2025) compared mobile-assisted vocabulary learning (MAVL) to classroom instruction in higher education and the former demonstrated higher retention in the long term and intrinsic motivation, whereas mobile portability offered spaced repetition in everyday life, and the gamified characteristic offered engagement continuity in line with the Hooked Model. These findings were furthered in (Hidayah, et al., 2025) that stated that Indonesian students utilizing digital reading showed quicker vocabulary acquisition and less decoding burden, allowing working memory to concentrate on higher-order understanding. Nonetheless, (Mukhtar & Abbas, 2025) added a novel requisite: the benefit of greater digital reading frequency failed to enhance retention in passive reading. Taking a break to note and reviewing the meanings yielded significantly improved recall of quality of engagement as a moderator, and supports the Lexical Quality Hypothesis idea that enduring learning is based on rich, multi-dimensional representations of words, not exposure. This was also supported by (Alamri & Hakami, 2022), who discovered that despite the overall positive position of students with regard to electronic dictionaries, the majority of them only used basic definitions and seldom took advantage of other more sophisticated functions as testament to the fact that effectiveness of tools does not lie in the availability but rather in the guidance of pedagogues.
Transitioning to format comparison, (Mekheimer, 2018) pitted pop-up, type-in, and printed dictionaries and found that pop-up users took the shortest time to complete a lookup as well as there were fewer interruptions in reading since definitions were presented as overlays in the reading interface. Printed dictionaries exerted the greatest cognitive burden, by literally disrupting the process of reading, which proves that integration, but not availability, is the measure of the effectiveness of a tool.
Expanding on the evidence about formats, (Alharbi, 2021) utilized Words Correct Per Minute (WCPM) to test the effect of a mobile app on young learners reading, and found that the faster reading and better understanding of information in the experimental group were explained by a decreased amount of word-recognition load released out of working memory, as predicted by the SVR. (Oleynick, 2021) experimented with a group of 5-8 grade students using Vocabulary Spelling City and discovered that spacing repetition and retrieval practices produced significant improvements in spelling, vocabulary, and aiding comprehension but clarified that the results were limited to teacher-planned applications and not incidental ones.
A moderating view was introduced by (Nwagwu, 2025): the high story is that digital literacy was a powerful predictor of reading performance, but high levels of social media use and task-switching had negative relationships with deep comprehension, indicating that digital literacy is an influential moderating factor in relation to the benefits of vocabulary tools.

Overbalancing the good news, (Wolf, 2018) states the Shallowing Hypothesis: deep and critical reading neural circuits could be reorganized by habitual patterns of digital reading: skimming, hyper link hopping, and divided attention supporting rapid over more in-depth processing. In the vocabulary learning, this is of concern because reactive studying of digital dictionaries can lead to poorer contextual inferencing to read independently. A similar study in (Yahmedi, 2019) offered a corroborating evidence of EFL students who did not report any problem with time saving but expressed concern that they were losing their ability to read independently due to over-reliance; several students mentioned their anxiety about having to read without technology, highlighting a psychic cost and cognitive advantage. These studies

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would assert the need to use tools in a moderated and pedagogically supported way as opposed to an unfettered embrace.

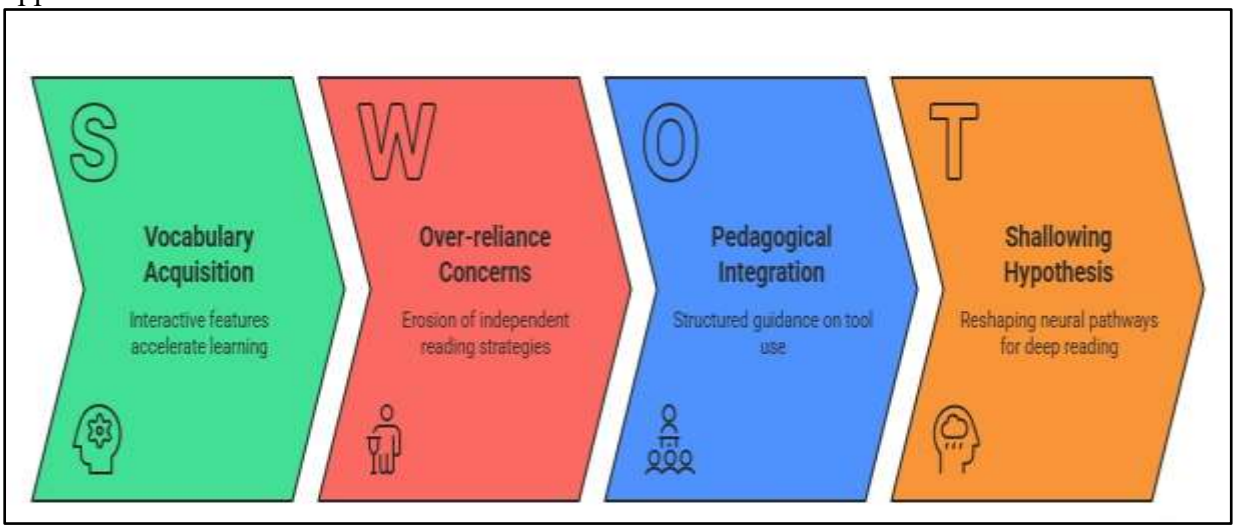

Figure 1 *Digital Dictionaries and Literacy*

Combined, the twelve studies provide a consistent image: with active involvement and effective teaching instructions, digital dictionaries and vocabulary applications can effectively help in vocabulary learning, reading fluency, reading comprehension, and reading motivation (Rasyidah, Triana, and Rizky, 2025), (Alisoy and Sadigzade, 2025), (Hidayah, et al., 2025), The underlying mechanisms described in (Perfetti & Hart, 2002) and (Mekheimer, 2018) are connected to lower the extraneous cognitive load and presenter word-level representations. All of (Mukhtar and Abbas, 2025), (Wolf, 2018), (Yahmedi, 2019) and (Nwagwu, 2025) draw attention to the real risks of passive engagement, over-reliance, attentional disruption, and deteriorating inference skills that need to be designed through proactive pedagogy. The current research builds upon this body of evidence to the Pakistani higher education, in which the access to devices, distribution of proficiency, and the infrastructure of institutions is a context minimally studied within international literature.

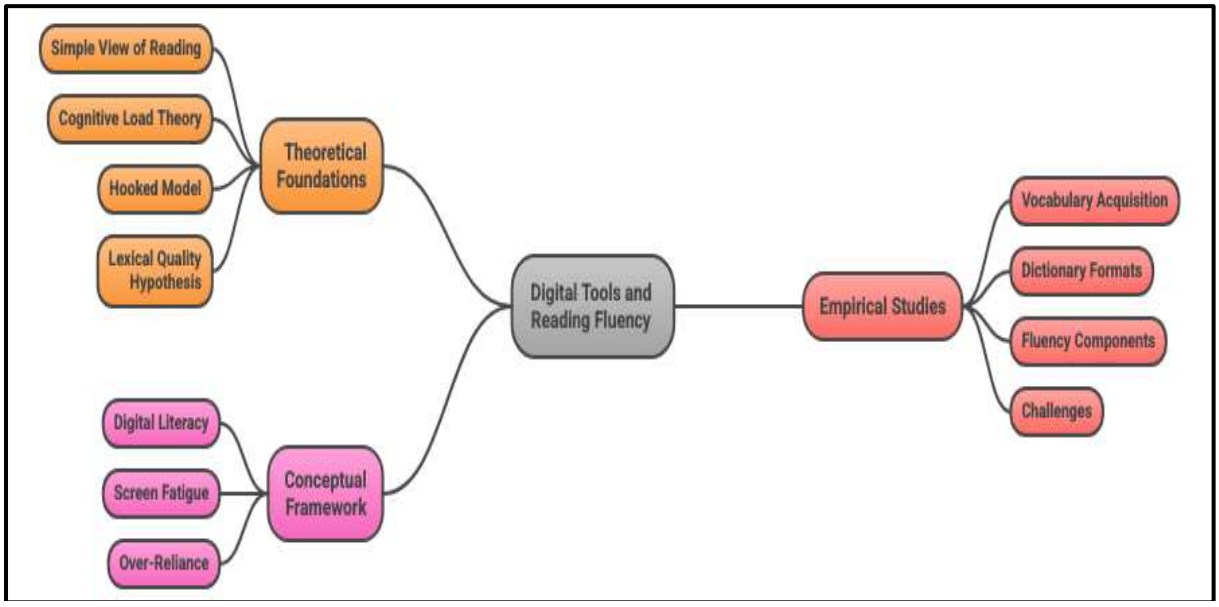

Figure 2 *Literature Review Map: Digital Tools and Reading Fluency*

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2.4 Conceptual Framework

The conceptual framework represents an integration of the findings of the theoretical and empirical literature and suggests particular connections between the characteristics of the digital tools, learner factors, and reading fluency outcomes. The most fundamental is the lessening of the extraneous cognitive load: with their instant provision of meaning in form of integrated and real-time definitions and pronunciation clues, digital dictionaries reduce the split-attention effect of traditional lookups. This is due to efficiency whereby more reading is being done and this promotes incidental acquisition of vocabulary. Reading rate and accuracy increases with the automaticity of word recognition, resulting in fluency and comprehension. But this is a good channel that is checked by the design and diversity. Extraneous load can be enhanced (as opposed to reduced) by visually cluttered tools or tools that demand more navigation. Without high digital literacy or familiarity with devices, low digital literacy users might become frustrated. The aspects that contribute to motivation via actual Hooked Model can cause distraction. Ideal impact is often based on the objectives of the learner, the circumstances faced in the task, and the design of the tool. Usage patterns and tool preferences, perceived effects on vocabulary, fluency, comprehension, and motivation, challenges recorded, and demographic and contextual moderators are operationalized in the present study.

Table1 *Conceptual Framework: Variables and Their Influence on Reading Fluency*

Variable Category	Component Description	Influence on Reading Fluency
Independent Variables (IV)	Digital Dictionary Type (Pop-up/Type-in), App Features (Audio/Gamification), AI Personalization.	Directly affects the speed and ease of word recognition.
Intervening/ Moderating Variables	Cognitive Load (Extraneous/Intrinsic), Motivation/Engagement (Hooked Model), Text Readability.	Mediates the relationship between tool usage and fluency outcomes.
Dependent Variables (DV)	Reading Rate (WCPM), Accuracy, Prosody, Incidental Vocabulary Growth.	Outcomes that reflect improved reading proficiency.

3. Methodology

3.1 Research Design

The current research employed a quantitative, descriptive survey design in order to examine the effects of digital dictionaries and vocabulary applications on perceived reading fluency, vocabulary acquisition and comprehension among the university students. The descriptive method enables systematic grouping of the answers, pattern finding and correlation of usage and perceived results. There is no manipulation of variables but the study is observational concerning existing behaviors and perceptions by a naturally occurring population of tool users (Figure 3).

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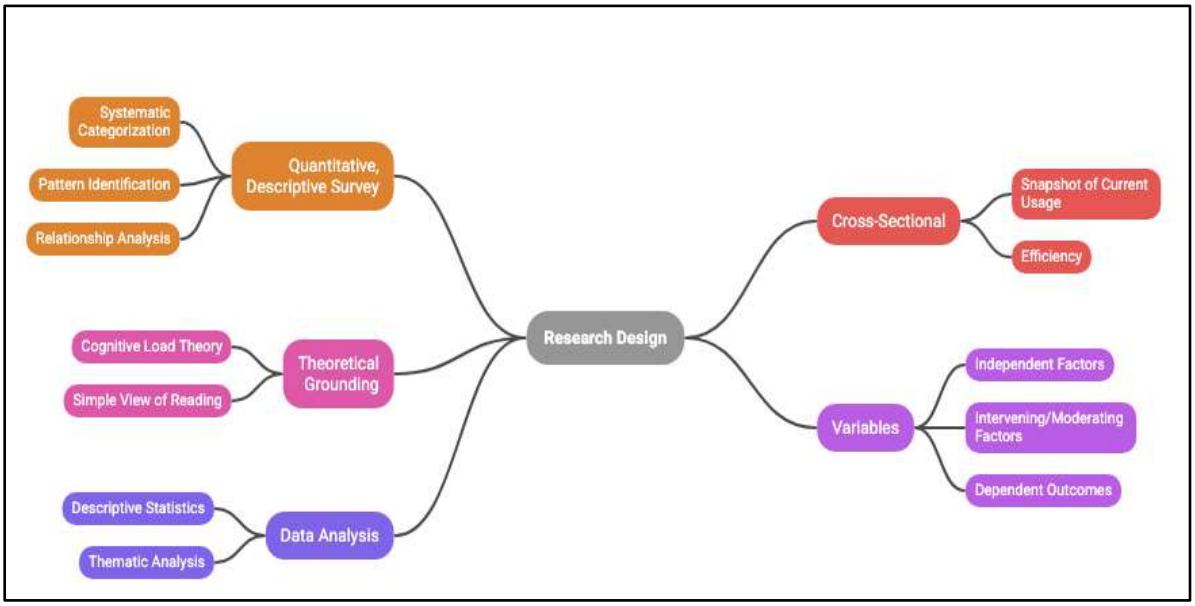

Figure 3 *Research Design for Digital Dictionary and Vocabulary Application Study*

It is cross-sectional in design: the study provides a moment in time of usage and perception but it cannot be used to draw causal conclusions or to track the situation over time. It is effective in producing descriptive correlational and initial evidence. The simple view of reading and Cognitive Load Theory are the theoretical basis. Factors are considered independent (type of tool, frequency, duration), intervening (cognitive load, motivation, engagement) and dependent outcomes (vocabulary, reading speed, confidence, comprehension). The data will be analyzed with the help of descriptive statistics (frequency, percentages, means), and thematic analysis of open-ended answers is a mixed-methods-lite method that will prioritize quantitative data with qualitative context (Figure 4).

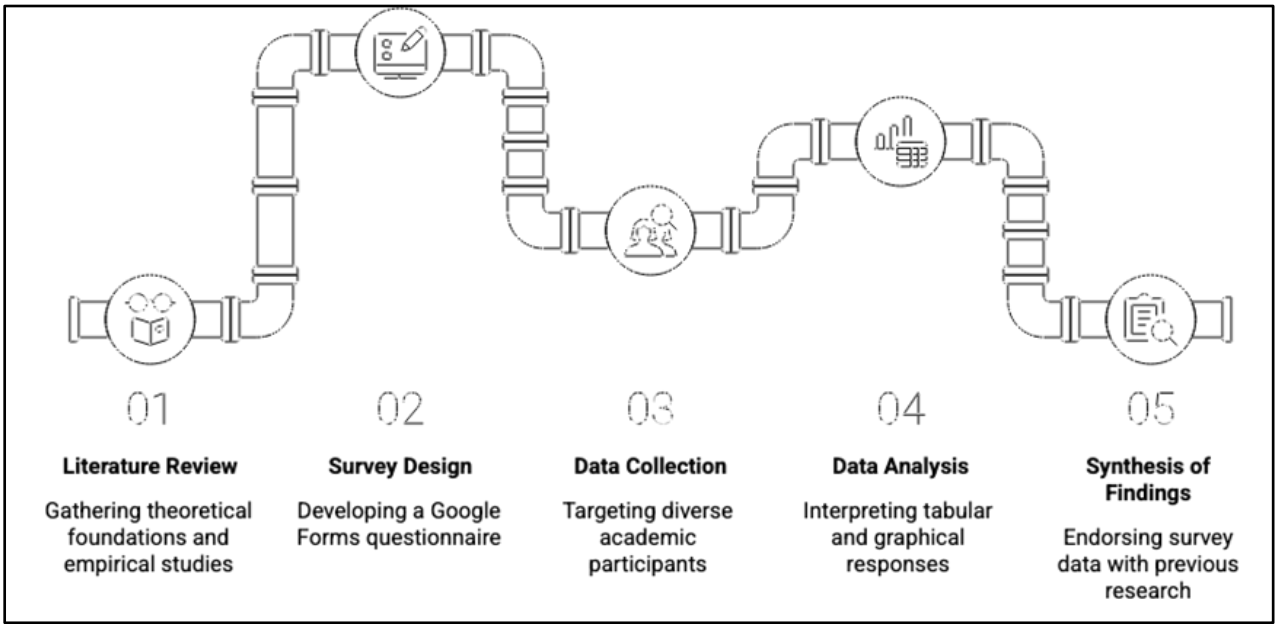

Figure 4 Research Study Process

3.2 Population and Sampling

The student population responded was that of the graduate and undergraduate students of Air

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University Multan Campus and institutions. Inclusion criteria were: (a) they have to be in active in the course of the provided service, (b) they have to be 15 years old and older and (c) they either used or currently use digital dictionaries or vocabulary applications. The convenience sample was attended to whereby the survey was distributed over network of university students and social media. Out of the 88 responses to which 5 responses were dropped because the data was missing leaving a n of 83. Demographically, the largest cohort comprised students aged 21–23 years (50.6%, n=42), followed by 18–20 years (15.7%), 15–17 years (12.0%), 24–26 years (10.8%), and 27 or older (9.6%). Gender distribution was 77.1% male (n=64) and 22.9% female (n=19). English proficiency self-ratings were: Intermediate 42.2% (n=35), Upper-Intermediate 32.5% (n=27), Advanced 12.0% (n=10), Elementary 9.6% (n=8), and Beginner 3.6% (n=3). Primary devices were: smart phone 44.6% (n=37), laptop/PC 25.3% (n=21), multiple devices 20.5% (n=17), and tablet 9.6% (n=8).Table 2 demonstrates the demographics and Figure 5 illustrates age distribution.

Table 2 *Sample Demographics Summary (n=83)*

Demographic Variable	Frequency (f)	Percentage (%)
Age 21-23 years	42	50.6
Male Gender	64	77.1
Intermediate Proficiency	35	42.2
Smartphone Primary Device	37	44.6
Valid Responses	83	100.0

3.3 Instrumentation of the study

The information was gathered with the help of a structured questionnaire uploaded online using Google Forms and presented in the form of seven thematic groups (Sections A through G) that included such topics as demographics and proficiency, usage patterns, vocabulary acquisition, reading fluency, reading comprehension, motivation and psychological impact, and challenges and limitations. The 5-point Likert scale items were scaled to each construct-frequency (1=Never, 5=Always), agreement (1=Strongly Disagree, 5=Strongly Agree) and quality (1=Very Poor, 5=Excellent). Qualitative background to the quantitative results was obtained through open-ended follow ups.

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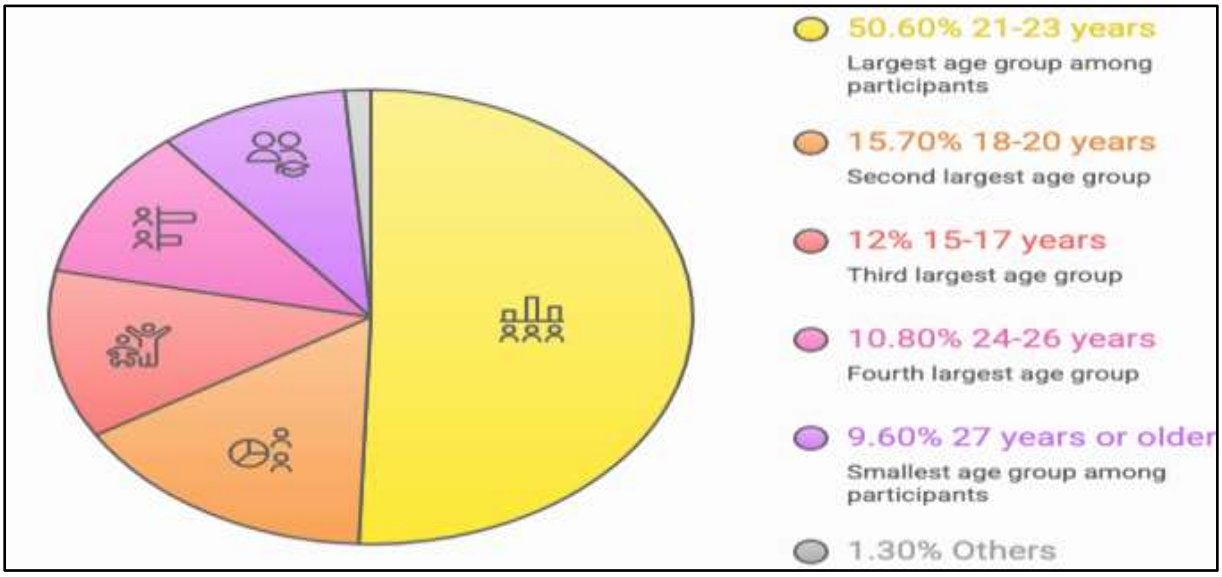

Figure 5 *Age Distribution of Sample Participants*

3.4 Validity and Reliability

Operationalization of each construct against Cognitive Load Theory and Simple View of Reading was used to establish content validity, and alignment with prior MALL studies. The seven sections were constructed in such a way that there was little cross-loading in items loaded on a single construct. The types of scales were item intent behavioral items (1=Never, 5=Always), perceptual items (1=Strongly Disagree, 5=Strongly Agree) and evaluative items (1=Very Poor, 5=Excellent). Cronbach alpha (Nunnally, 1978) was used to measure internal consistency with an alpha of 0.70 acceptable / 0.80 good / 0.90 excellent (George & Mallery, 2003) Section B Usage (0.903), Section E Comprehension (0.946) excellent, Section D Fluency (0.8 Section C Vocabulary (0.685) was slightly below threshold, and probably indicates construct multidimensionality; and Section G challenges (0.614) was lowest, which is likely due to item heterogeneity.

3.5 Data Collection Procedure

The questionnaire was shared through departmental WhatsApp groups with an informed consent statement to guarantee voluntary participation, anonymity, confidentiality, and data use of data only in academics. The survey lasted about 8-10 minutes, and was open 3-17 April 2026. The automatic time stamping of the responses made the collection of responses; only n=83 of 88 submissions satisfied the criteria of giving demographic information, so the final sample consisted of n=83.

3.6 Data Analysis Techniques

Descriptive statistics were used to assess Likert item quantitative data. To describe the central tendency and variability, frequency distributions and percentages were established in each item and means, standard deviations and modes. The contents in each of the theoretical dimensions were in some cases treated as subscale mean-grouped. The structure of open-ended answers was done through thematic weighting methods: the coded pieces were categorized into broad themes that give qualitative descriptions of the quantitative results. Descriptive analysis was accompanied by three inferential tests. The six composite subscale scores were computed and the product-moment correlation between them was computed using (Cohen, 1988) effect-size conventions. The independent-samples t-tests compared male and female differences in four outcome subscales.

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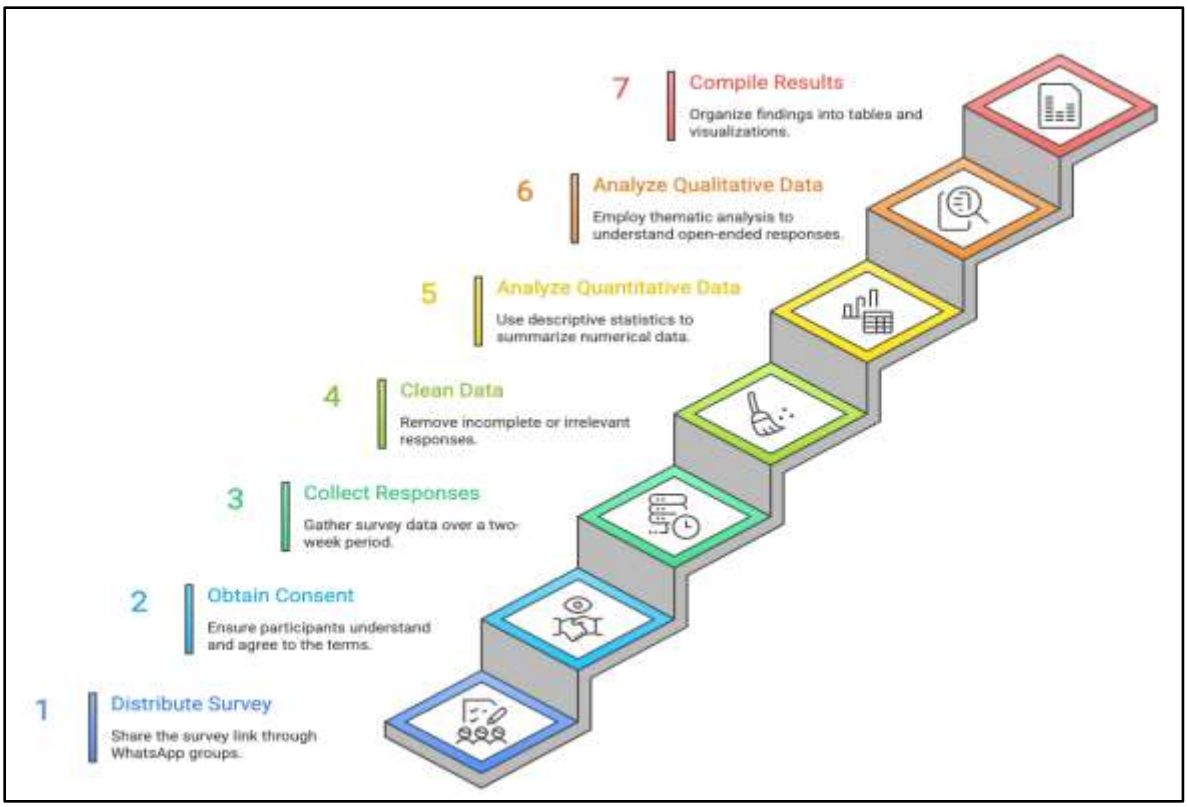

Figure 6 *Conducting the Survey and Analyzing Data*

4. Results

4.1 Demographic Analysis

Table 2 summarized the sample of 83 valid respondents as mostly males (77.1%), the most common age in the sample was 21-23 years (50.6%). English proficiency was spread across levels with most of them considering themselves as Intermediate (42.2%), then Upper-Intermediate (32.5%). Smartphones were the most prevalent tool in digital literacy practices (44.6%), by far outperforming the use of laptops/PCs (25.3%). Since this population mostly relies on mobile devices (74% respondents indicated this), a built-in dictionary design is especially important among them since the small display does not accommodate side by side window management and enhances the split-attention effect due to small screens. Figure 7 is the synergized demographic and device analysis.

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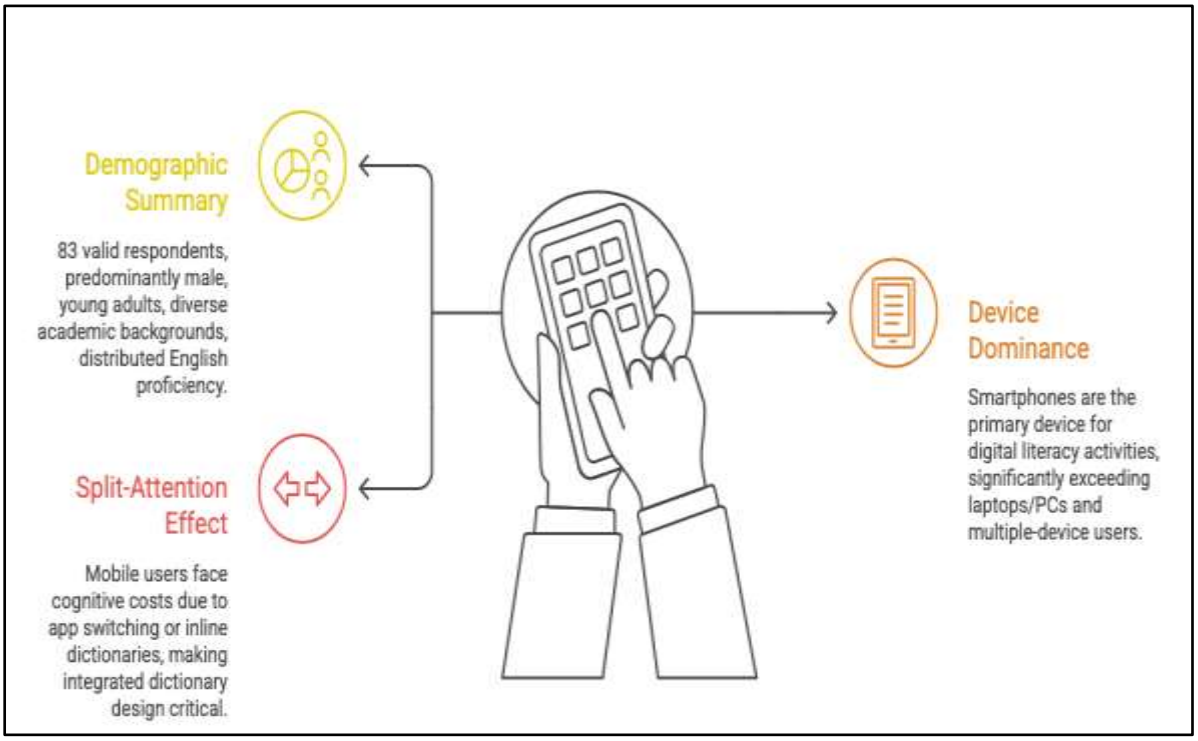

Figure 7 Demographic and Device Analysis

4.2 Digital Dictionary and App Usage Patterns (Section B)

Part B of the survey scaled the frequency of participation in different vocabulary application and digital dictionary use behaviours. The mean responses obtained because of the 1-5 frequency scale (1=Never, 5=Always) indicated a medium general level of engagement with a mean of 2.41-3.05 over the six items, as highlighted in (Table 3).

Table 3 *Digital Dictionary Usage Patterns (n=83), Frequency Scale: 1=Never, 5=Always*

Usage Behavior Item	Mean	Std Dev	Mode
Lookup when encountering unfamiliar words	3.05	1.20	4
Check pronunciation before reading aloud	2.72	1.11	3
Daily or weekly app routine use	2.41	1.18	1
Lookup rather than skip unknown words	3.05	1.06	4
Revisit saved words using history/flashcards	2.43	1.16	3
Prepare for reading assignments using apps	2.77	1.38	4

The most frequent behaviour of all was the look up of a word that is unfamiliar to the student (M=3.05, mode=4) and look up instead of look bypass (M=3.05, mode=4) both of which imply that digital tools have changed the behaviour of students to be more tolerant to ambiguity than being immediately resolved but possibly at the expense of inference strategies. Use was much lower on a daily/weekly basis (M=2.41,mode=1) with 30.1% choosing Never. The vast majority of students reactively employ digital tools when reading, but not proactively in the study processes a contrast that would retain them, as routine use reinforces spaced study and long-term learning.

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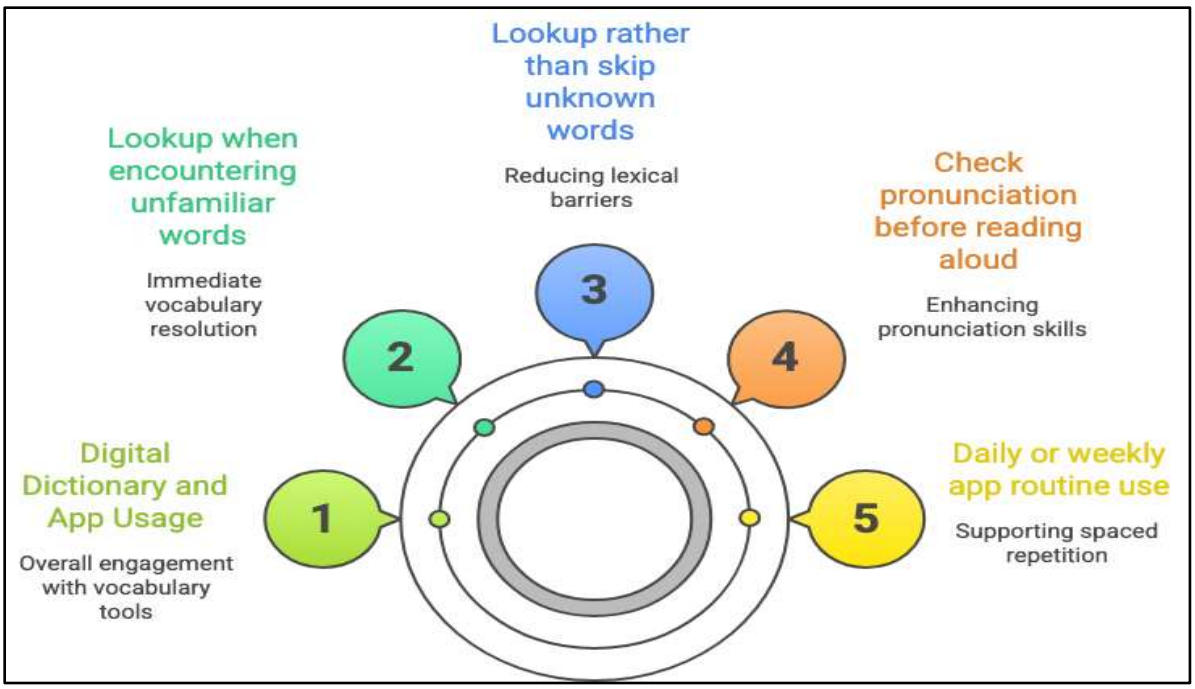

Figure 8 *Digital Dictionary and App Usage Patterns*

4.3 Perceived Impact on Vocabulary Acquisition (Section C)

Section C assessed participants' perception of how digital dictionaries and vocabulary applications influence vocabulary learning and retention. All six items used a 5-point agreement scale (1=Strongly Disagree, 5=Strongly Agree). Mean responses ranged from 3.24 to 3. 54, indicating generally moderate to strong perceived positive impacts (see Table 4).

Table 4 *Perceived Impact on Vocabulary Acquisition*

Vocabulary Impact Item	Mean	Std Dev	Mode
Help learn exact word meanings quickly	3.54	1.23	4
Remember newly learned words longer	3.29	1.01	4
Example sentences aid contextual understanding	3.40	1.11	4
Flashcard features improve retention	3.24	1.25	4
Notice increase in vocabulary size	3.25	1.09	4
Perceive growth in word knowledge (Item 6)	3.35	1.08	4

Perceived long-term retention was weaker (M=3.29, 58.0% positive), reflecting low engagement with review features and supporting the finding of (Oleynick, 2021) that spaced-repetition tools may outperform dictionary-only apps for durable retention. Example sentences (M=3.40) and flashcards (M=3.24) drew approximately 63% positive endorsement, consistent with the Lexical Quality Hypothesis. Perceived vocabulary growth (M=3.25 and 3.35) drew 56–60% positive responses and 40–44% neutral, indicating varied effectiveness across learners (Figure 9).

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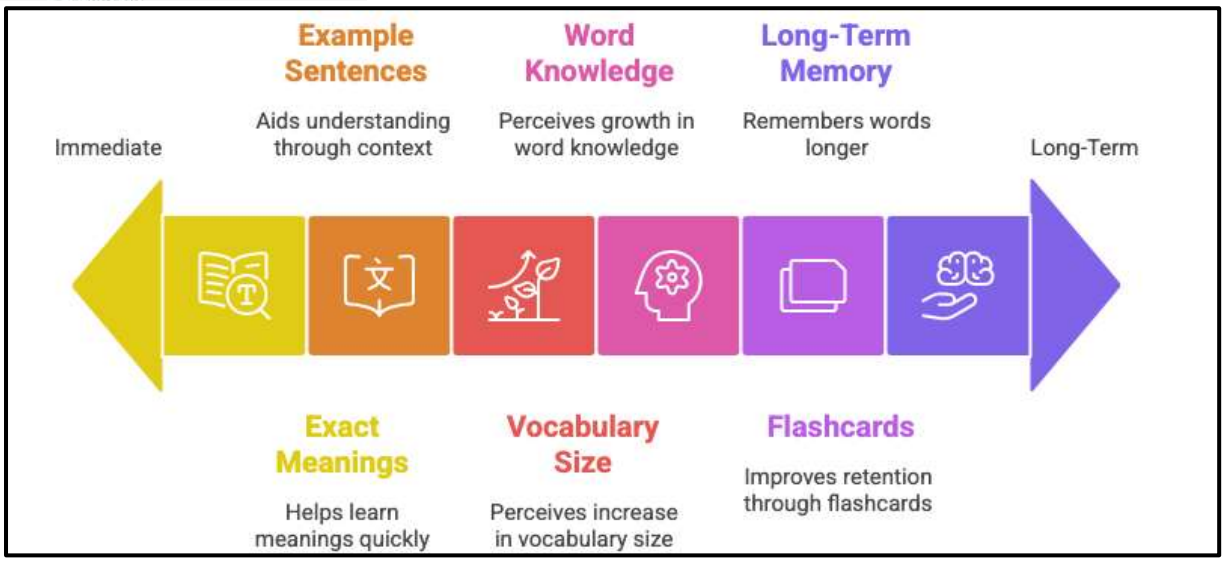

Figure 9 *Perceived Impact of Digital Dictionaries on Vocabulary Acquisition*

4.4 Perceived Impact on Reading Fluency (Section D)

Section D explicitly evaluated the perception of the participants on the effects of digital tools on reading fluency, which includes reading speed, reading fluency, confidence and reading flow. These were put forward in the 5-point scale of agreement items and their results displayed in (Table 5).

Table 5 *Perceived Impact on Reading Fluency (n=83)*

Reading Fluency Item	Mean	Std Dev	% Agree / Strongly Agree
Reading speed has improved	3.10	1.07	63.9
Read more fluently with better word recognition	3.25	1.17	65.1
Looking up words disrupts reading flow	3.12	1.14	57.8
Fewer pauses when using apps regularly	3.16	1.04	59.0
More confident with longer texts	3.27	1.06	67.2
Reading smoother with pre-studied vocabulary	3.43	1.08	71.1

Fluency improvement seen as perceived are concentrated around M=3.1-3.4 with 60-71 percent agreement. The most highly endorsed suggestions as per the Lexical Quality Hypothesis that the automatic recognition of words liberates working memory to establish comprehension were the most long text (M=3.27, 67.2) and smoothness (M=3.43, 71.1) with pre-studied vocabularies. Interestingly, 57.8 percent admitted that consulting words breaks reading fluency (M=3.12) but same respondents reported general fluency advantage, indicating the compensatory extra burden of navigating persists, and the compensatory intrinsic- burden reduction of overcoming word-based uncertainty is obtained. Caveat: measurement is taken by perception. Objective gains were observed in (Alharbi, 2021) and (Oleynick, 2021) with the use of WCPM, thus these values might not reflect the true improvement (Figure 10).

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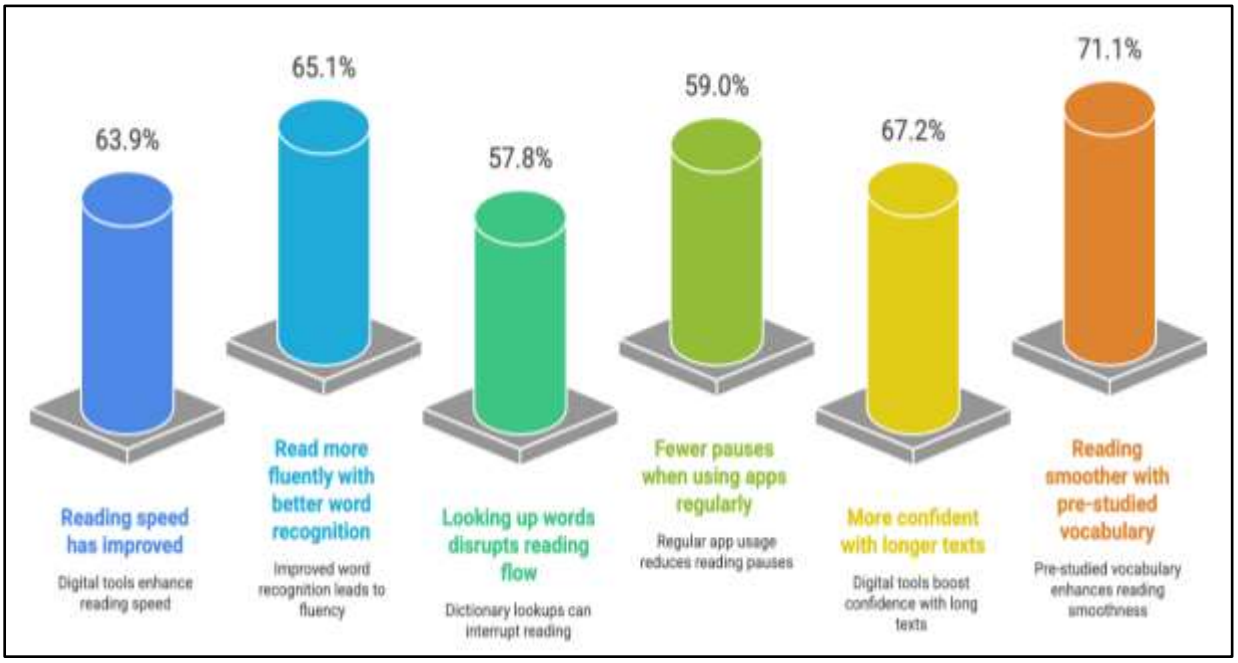

Figure 10. *Perceived Impact of Digital Tools on Reading Fluency*

4.5 Perceived Impact on Reading Comprehension (Section E)

In Section E, the perceived effectiveness of digital tools, in particular, in reading comprehension, determined a 5 point quality scale. There were five items that measured various aspects of comprehension support as indicated in (Table 6)

Table 6 *Perceived Impact on Reading Comprehension (n=83)*

Comprehension Item	Mean	Standard Deviation
Digital dictionaries help understand passage meaning	3.54	1.12
Quality of definitions provided by preferred tool	3.47	1.06
Vocabulary apps help answer comprehension questions	3.59	1.05
Explain multiple meanings of single word in context	3.54	1.16
Overall reading comprehension improvement	3.42	1.08

The comprehension items had a range of 3.42 to 3.59 which represented the moderately strong perceived impact. The most was app effectiveness in responding to comprehension questions (M=3.59, 70.5% Good/ Excellent), relating vocabulary clarity, and comprehension and task success. The ability to interpret passages (M=3.54) and the ability to read between the lines (M=3.54) was also high. Some of the comprehension items outnumber M=3.50 a pattern not found in other directions suggesting that comprehension is one of the major benefits perceiving the participants based on the Simple View of Reading. Awareness of tool-to-tool variation had a quality score of slightly lower (M=3.47, 69.6%), which is shown in Figure 11.

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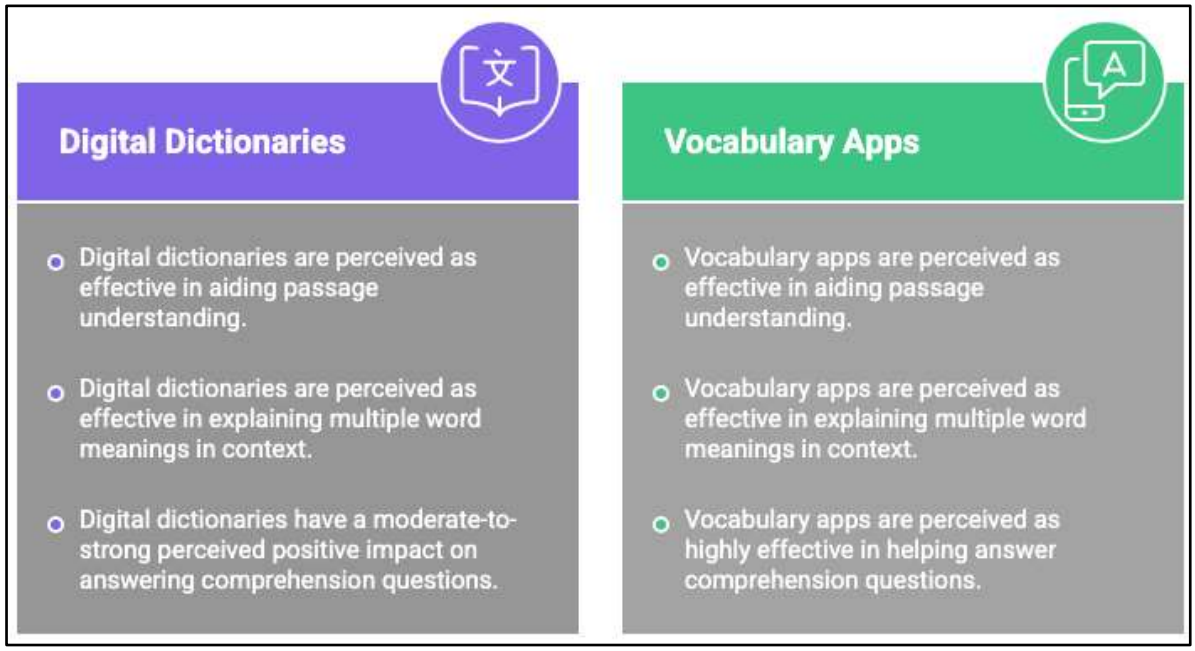

Figure 11 *Which Digital Tool Offers Superior Reading Comprehension Support?*

4.6 Impact on Motivation and Psychological Well-being (Section F)

Section F assessed psychological and motivational impacts of digital tools and theorized that digital tools had potential to alleviate anxiety, increase confidence, and elicit a wish to read. A 5-point scale of agreement measured these constructs and these results were as (Table 7).

Table *7 Motivation and Psychological Impact*

Motivation & Psychological Item	Mean	Std Dev	% Agree/ Strongly Agree
More motivated due to anxiety reduction	3.30	1.03	62.7
Increases confidence for academic texts	3.46	1.03	68.7
Less afraid of difficult vocabulary	3.45	0.94	67.5
Reading feels rewarding and achievable	3.46	1.03	67.5
Sense of progress in reading skills	3.52	1.07	71.1
Reduces frustration with challenging material	3.64	1.04	75.9

The most persuasively good results were observed in the motivation section where all the six items scored a higher mark than the M=3.30. The highest mean in the entire survey was reduction of frustration (M=3.64, 75.9 percent) which demonstrates that digital tools can decrease the affective filter (Krashen, 1982) in that vocabulary barriers could be controlled. Sense of progress (M=3.52, 71.1%) and reading confidence (M=3.46, 68.7) indicate that instruments build perceived competence to be a force in intrinsic motivation in self-determination theory (Deci and Ryan, 1985). These dimensions of the affect address such powerless areas as a little-studied, but potentially powerful, process through which digital tools help sustain reading activity, which means that there should be less anxiety but less content interest and authenticity in work.

4.7 Reported Challenges and Limitations (Section G)

Section G evaluated issues and bad experiences connected to the use of digital tools using a 5

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point frequency scale (1=Never, 5=Always). Theoretically and practically important challenges were reported in five items (Table 8).

Table 8 *Reported Challenges and Limitations (n=83), Frequency Scale: 1=Never, 5=Always*

Challenge Item	Mean	Standard Deviation	% Often/Always
Looking up words interrupts focus	3.65	1.11	65.1
Over-reliance; struggle without tools	3.08	1.39	44.6
Notifications/pop-ups distract during reading	3.16	1.02	48.2
Difficulty retaining word meaning after lookup	3.00	1.16	39.8
Internet connectivity issues prevent use	2.95	1.16	37.3

The issues part showed a paradox where participants showed different high positive impacts but significant negatives. The greatest challenge was lookup-induced distraction (M=3.65, 65.1% Often/Always) in support of the CLT split-attention prediction. But high-stakes benefits of vocabulary (74.7%), confidence gains (67.2%), and disruption tolerance were simultaneously high among students (70.5%). High variability (SD=1.39) shows divergent experiences, which is why over-reliance was over-rewarded (M=3.08, 44.6%).

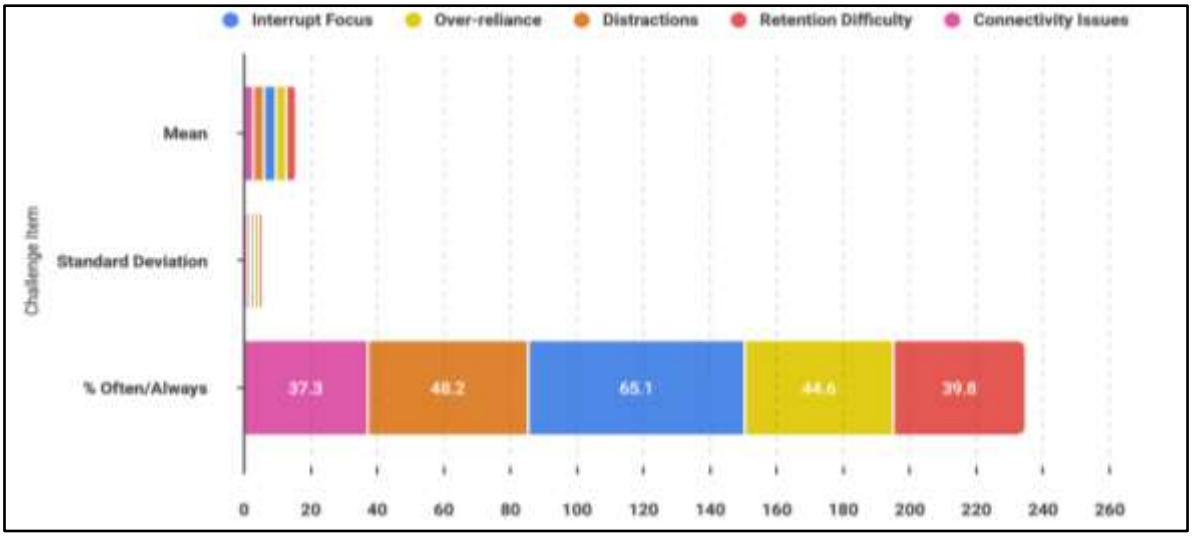

Figure 12 *Reported Challenges and Limitations of Digital Tool Use*

Distraction in notification was experienced by almost half of the sample (48.2%). Post-Lookup retention difficulty (M=3.00, 39.8) confirms the Lexical Quality Hypothesis: When elaborated upon in single exposure, little enduring learning occurs. Poor connectivity (M=2.95, 37.3%) can be attributed to structural limitations in Pakistan meaning that offline-enabled tools are one of the solutions (Figure 12).

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4.8 Pearson Correlation Results

Table 9 *Pearson Correlation Coefficients Between Subscale Composite Scores (n=107)*

Variable Pair	r	p-value	Effect Size	Direction
Usage Patterns → Vocabulary Acquisition	0.731	< 0.001	Large	Positive
Usage Patterns → Reading Fluency	0.825	< 0.001	Large	Positive
Vocabulary Acquisition → Reading Fluency	0.844	< 0.001	Large	Positive
Reading Fluency → Motivation	0.818	< 0.001	Large	Positive
Reading Fluency → Comprehension	0.916	< 0.001	Large	Positive
Challenges → Reading Fluency	0.406	< 0.001	Medium	Positive

The six correlations were all significant with p<0.001 (Table 9). The strongest correlation was found between reading Fluency and Comprehension (r=0.916), which is consistent with the Simple View of Reading (Gough and Tunmer, 1986). Vocabulary Acquisition and Fluency (r=0.844) proves the ideas as fluency is mediated by vocabulary knowledge. Usage and Fluency (r=0.825) has a connection between perceived gains and regular tool use. There is a correlation of Fluency and Motivation (r=0.818) and the Affective Filter Hypothesis (Krashen, 1982). The medium positive correlation between the Challenges and Fluency (r=0.406) may represent the increased gains and increased challenges faced by heavier users.

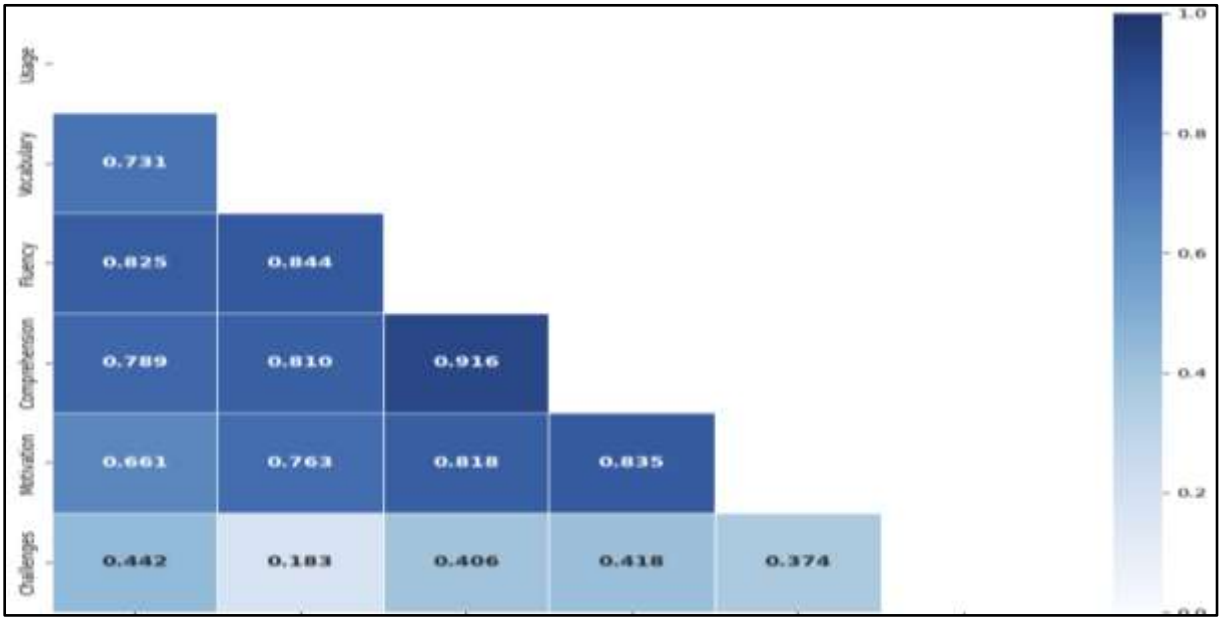

Figure13. *Pearson Correlation Matrix*

4.9 Independent Samples t-Test: Gender Differences

Table 10 *Independent Samples t-Test Results: Gender Differences across Subscales*

Subscale	Male n	Male M	Male SD	Female n	Female M	Female SD	t / p
Reading Fluency	77	2.801	0.862	30	3.767	0.437	t=-5.84, p<.001
Vocabulary	77	3.010	0.818	30	3.573	0.419	t=-3.59,

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Acquisition							p<.001
Motivation & Well-being	77	3.288	0.604	30	3.917	0.444	t=-5.18, p<.001
Reading Comprehension	77	2.984	1.027	30	4.060	0.452	t=-5.52, p<.001

There were large gender differences in all four subscales ($p<0.001$). There was always a higher mean in female participants compared to the male participants: Reading Fluency (3.767 vs. 2.801), Vocabulary Acquisition (3.573 vs. 3.010), Motivation (3.917 vs. 3.288), and Comprehension (4.060 vs. 2.984). The gap in comprehension was maximum (1.076 points). The larger standard deviations of that of the men mean something more diverse male experiences.

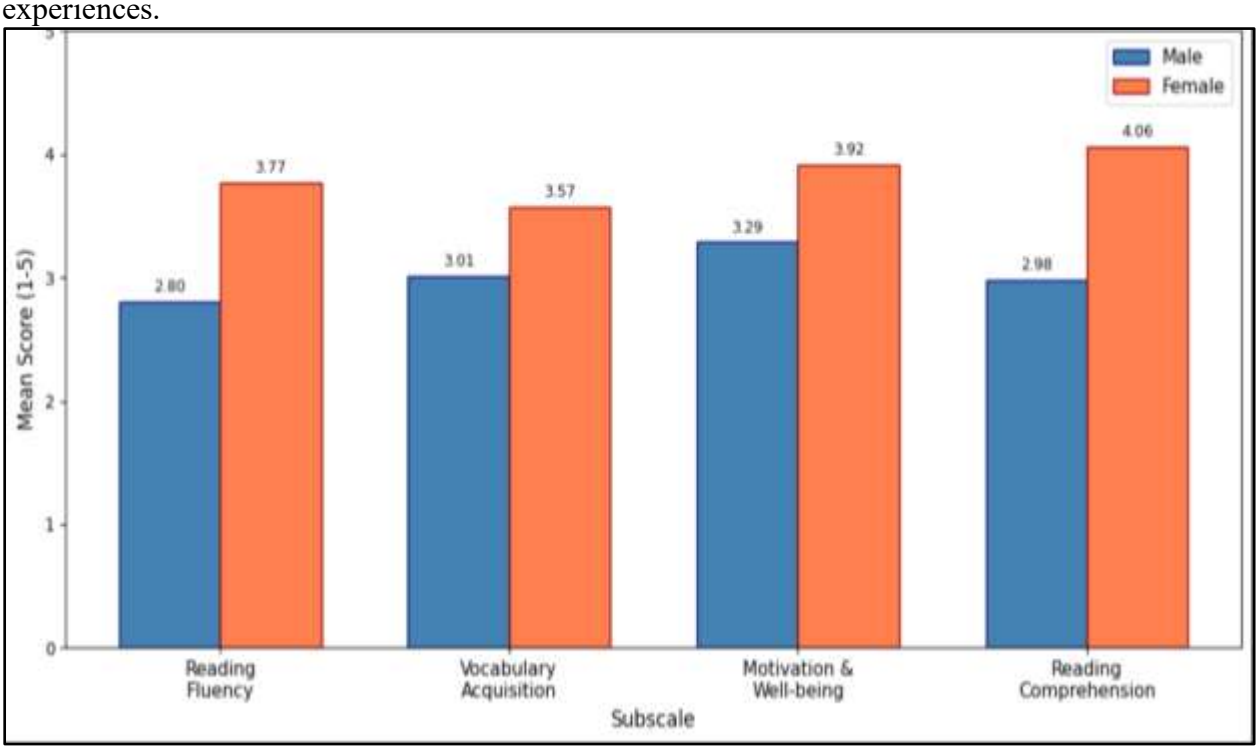

Figure 1412 *Gender Differences Across Subscales (t-Test)*

4.10 One-Way ANOVA: Group Differences Across Multiple Categories

One-way ANOVA was used to test differences among groups based on their level of English proficiency (5 groups), their age (5 groups), and the type of their main device (4 groups). A large F-statistic means that at least one of the group means is different; it should be followed by pair wise comparisons in the future researches.

4.10.1 ANOVA by English Proficiency Level

Table 11 *One-Way ANOVA Results English Proficiency Level vs. Subscale Scores*

Subscale	F Statistic	df Between	df Within	p-value	Significant
Reading Fluency (D)	16.891	4	113	< 0.001	Yes
Vocabulary Acquisition €	7.667	4	113	< 0.001	Yes
Motivation & Well-being (F)	8.167	4	113	< 0.001	Yes

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Reading Comprehension €	25.320	4	113	< 0.001	Yes
Usage Patterns (B)	16.044	4	113	< 0.001	Yes

Table 12 *Means and Standard Deviations Proficiency Level vs. Reading Fluency Score*

Proficiency Level	Mean (M)	SD	Variance	Interpretation
Beginner	3.917	0.118	0.014	Highest perceived benefit
Elementary	3.731	0.302	0.091	Very high perceived benefit
Advanced	3.429	0.508	0.258	Moderate-high benefit
Intermediate	3.353	0.676	0.457	Moderate benefit
Upper-Intermediate	2.468	0.867	0.752	Lowest perceived benefit

ANOVA indicated significant group differences in all the five subscales ($p<0.001$). An inverse correlation between proficiency and perceived fluency benefit is the most remarkable (Table 12): learners of the Beginner stage (M=3.917) and Elementary stage (M=3.731) exhibited the most gains, followed by the learners of the Upper-Intermediate level (M=2.610). This is consistent with the Simple View of Reading upper-proficiency readers access fewer unknown words, thus any single time a word is looked up results in greater fluency gains. The biggest ANOVA effect was on Comprehension (F=25.320), which indicated that proficiency moderates the comprehension-related perceptions most significantly.

4.10.2 ANOVA by Age Group

Table 13 *One-Way ANOVA Results Age Group vs. Reading Fluency Score*

Age Group	M (Fluency)	SD	M (Vocab)	M (Motivation)	F / p
15-17 years	3.556	0.564	3.578	3.870	F=33.73
18-20 years	3.672	0.390	3.460	3.817	p<.001
21-23 years	3.369	0.835	3.265	3.628	
24-26 years	3.229	0.750	3.156	3.370	
27 or above	2.059	0.329	2.677	2.989	

The most significant F-statistic (F=33.727, $p<0.001$) was the age, which is why this demographic predictor was significant. Younger learners (15–17: M=3.556; 18–20: M=3.672) reported the greatest perceived benefits; the 27+ group the least (M=2.059) a gap above 1.6 points. This is probably due to digital nativity and exposure to mobile vocabulary tools: younger learners incorporate them more easily, whereas older ones might have already developed alternative approaches to reading or the split-attention effect can be more disruptive to them.

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4.10.3 ANOVA by Primary Device Type

Table 14 *Primary Device vs. Reading Fluency and Vocabulary Scores*

Device Type	M	SD	M (Vocab)	SD	F / p
Smartphone	3.427	0.761	3.404	0.712	F=3.477, p=.019
Tablet	3.400	0.573	3.267	0.451	(Fluency)
Multiple Devices	3.091	0.956	3.160	0.776	F=5.227, p=.002
Laptop/PC	2.847	0.892	2.931	0.872	(Vocabulary)

The type of device had considerable Fluency (F=3.477, p=.019) and Vocabulary (F=5.227, p=.002) results. The smartphone users had the highest perceived benefits of fluency (M=3.427) and then the tablet followed with multi device (M=3.091), then the lattice/ laptop PC users (M=2.847). Though this seems counter-intuitive when we consider mobile split-attention issues, it is probably due to the experience of smartphone users with applications such as U-Dictionary which can provide built-in pop-up available of a dictionary, negating cognitive cost in favour of required cognitive cost. There are also laptop/PC users that read more scholarly texts in which external lookups are not as necessary.

4.11 Synthesis of Quantitative Findings

There appears to be a consistent pattern between sections. Enhancements in positive perception: 60-76 percent give report of meaningful gains in vocabulary, fluency, comprehension and motivation (means 3.2-3.5).Most endorsed benefits: frustration reduction (75.9), comprehension support (70.5), confidence working with long texts (67.2), perceived vocabulary development (56-60).Trade-offs: 65 percent report distraction, 4548 percent over-reliance and consideration, 40 percent retention challenge. Usage outcome discrepancy: students look-up actively (M=3.05) and rarely review (M=2.43) even though features of review are rated as important (M=3.24 -3.40) awareness is more important than practice. Mobile phone hegemony: 74% of use is mobile-primary; pop-up interfaces must be integrated. Overall, digitally-based tools exhibit rapid access to vocabulary but not reading: they can be enhanced in terms of design and teaching.

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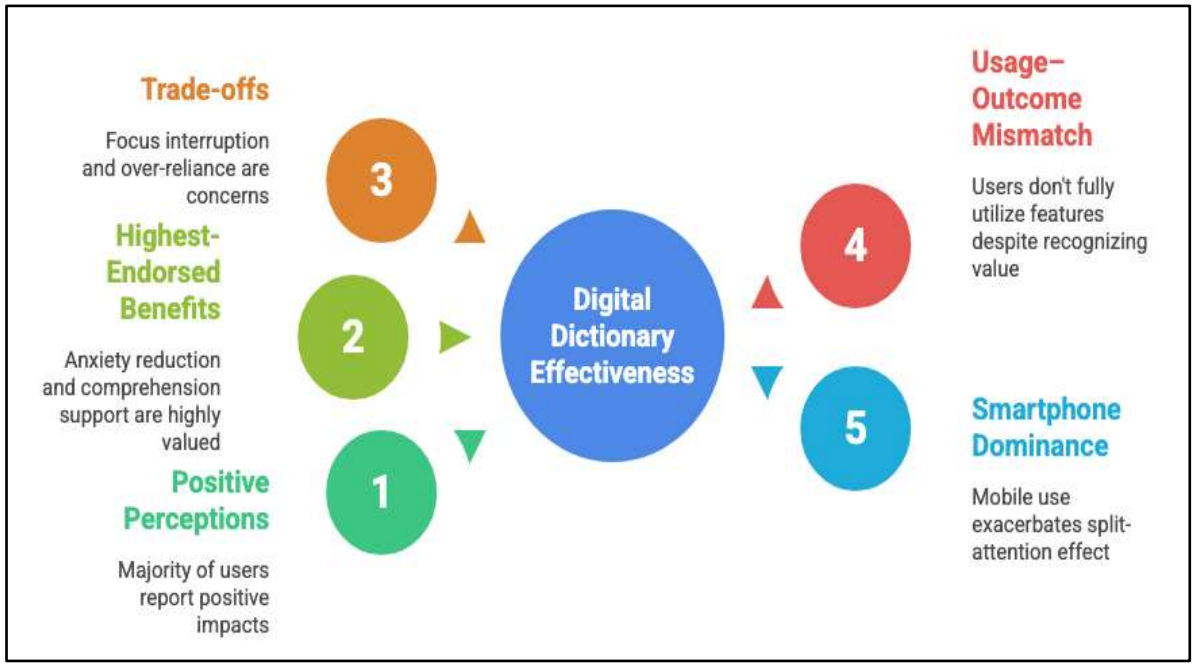

Figure 15 *Factors Influencing Digital Dictionary Effectiveness*

5. Discussion

The obtained results substantiate the assumptions of the Cognitive Load Theory and the Simple View of Reading in an empirical way and outline the contradictions and possibilities of how the tools can be designed and the practices of learners can be enhanced.

The SVR believes that fluency is a result of automatic recognition of words and language understanding. This chain is proved by the 74.7% indicating to the rapid meaning acquiring and 71.1% indicating to having smoother reading following the pre-study clarified vocabulary is moving the mind out of the decoding mode to the comprehension mode. Split-attention effect is also validated 65 report focus interruption but the same report reading gains, which makes sense that extraneous load of navigation is overcome by intrinsic-load reduction by solving a vocabulary uncertainty. As (Mekheimer, 2018) determined, the use of pop-up dictionaries is significantly better at minimizing the search time and cognitive burden, in comparison with type-in and printed dictionaries. The current results reinforce this indirectly: the 65% reporting interruption is, probably, indicative of using standalone applications that need complete context-switching. Pop-up or inline interfaces- Most of the time there can be a significant reduction in interruption whilst still benefiting. This design necessity is acute in the 74 percent of the sample who rely on smartphones as their main device: due to small screens, it is impossible to manage side by side windows, so it is necessary that native definitions of popups or ready-to-use vocabulary be developed.

The best lone finding frustration reduction at 75.9% indicates affective aspects that are similar to current technical literature reviews that do not focus on the affective aspects. Affective Filter Hypothesis Affective Filter Hypothesis states according to which negative emotions impose a psychological barrier to learning. (Krashen, 1982) Digital resources seem to help decrease this filter significantly: ensuring the vocabulary barrier is not so daunting causes less anxiety during L2 reading and results in more permanent engagement and improved performance. This process should be given more emphasis in future studies which have previously looked at the study with tunnel vision by only emphasizing cognitive variances over the emotional mediators of reading behavior.

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There arises a vital discrepancy between ideal and reality practice. Vocabulary studies focus on spaced repetition, retrieval practice and elaborative encode but the sample reveals low involvement in these (M=2.43 revisiting, 2.41 routine use) compared to higher reactive lookup (M=3.05). In a Lexical Quality Hypothesis view this is alarming: one exposure is only enough to acquire instant knowledge but not long-term memory of the information (data). Thus it is no surprise that rapid acquisition (M=3.54) should fare better than long-term retention (M=3.29). This disconnect can be bridged by instructors when creating assignments that demand post-reading review, or by developers of spaced-repetitions apps can be fore grounded instead of buried in sub-menus in primary reading.

The current results are consistent with the previous studies. Here, as reported (Rasyidah, Triana, and Rizky, 2025) and (Hidayah, et al., 2025), the strong positive impacts were reported in perception ratings. The authors emphasized that learning-strategy integration affects the efficiency (Alamri and Hakami, 2022), and the gap in reactive use and a structured review contributes to it. The perceptual gains here were consistent with objective gain as demonstrated in (Alharbi, 2021) and (Oleynick, 2021). This paper brings nuances on issues. The acquisition-retention gap and the 65% interruption give particular targets of improvement. The field needs to shift away to recording of benefits to the maximization of tool design as well as the integration of instructions.

6. Implications

The results have practical, theoretical and policy implications. In practice, educators and school leaders ought to stop incidental application towards integrative application of digital dictionaries and vocabulary applications on courses in reading, especially among lower-proficiency instructed learners that perceive the greatest benefits. Integration is to contain explicit assignments of new words, flashcard revision/re-reading retrieval activity, to turn reactive look-up into long lasting learning. Learning institutions ought to prefer to use the combined dictionary tools rather than single applications, as the split-attention effect is the most significant on a smartphone. To developers, the design requirements of focus-interruption and notification data include: in-context pop-ups, notifications which are user controllable, default-on spaced repetition, and solid offline. Theoretically, the research confirms the Simple View of Reading in technology-mediated learning, builds on Cognitive Load Theory by demonstrating that learners can accommodate moderate loads in situations where intrinsic loads drop, and the Affective Filter Hypothesis as a fruitful frame. Policy-wise, universities located in Pakistan and South Asia ought to consider digital vocabulary infrastructure as an element that needs purposeful investment, personnel growth, and legal equal distribution instead of an adopted one.

7. Recommendations

On the findings, four audiences are included in the recommendations. Curriculum designers and teachers ought to find ways of engaging digital dictionaries and vocabulary apps in structured reading instruction through pre-reading vocabulary training, explicit in class use guidelines, and post-reading review, which is based on spaced repetition. Institutions ought to migrate to integrated methodology of dictionaries pop-up browser additions, e-reader vocabulary tools, in-app translators more than independent applications, in the M-phone-sensitive environment and the divide (attention) of distraction. Developers ought to implement foreground reminding in the initial reading flow and flashcard, not moving them to the sub-menus but provide the users with personalized settings to choose the frequency of notifications, and make the product offline to the students whose connections are not always stable. Pakistani and South Asian universities should approach digital tool integration as institutional infrastructure, meaning investing in the training of the staff, Wi-Fi connectivity,

and provision of the devices to use at the outset, instead of having staff adoption to be a matter of discretion. Future studies ought to overcome the methodological constraints of the current research via longitudinal designs of objective measures of fluency stratified by proficiency, and experimental designs that isolate causal effects.

8. Future Research Directions

There are a few questions which should be investigated. To reinforce causal assertions, first, longitudinal research based on objective measures of reading speed, comprehension, and vocabulary size as opposed to perception alone would be more convincing. Second, the split-attention hypothesis could be directly tested and the most effective interface attributes could be found by comparing experimental designs of integrated and standalone dictionary versions. Third, the 40 percent who feel no gain would also make the qualitative research more clear in terms of what's different between the responders and non-responders differences in usage, app type or reading purpose. Fourth, interactions of tools-proficiency: are all students of varying proficiency equal, or are some tools better suited to some students than to others? Lastly, examining the mediating role of anxiety reduction, and whether explicit consideration of affective aspects can lead to improvement in tools.

9. Conclusion

This paper has explored how digital dictionaries and vocabulary apps can be used to facilitate reading fluency in university students. Overall, these tools help reduce the barriers to second-language reading: students note higher rates of meaning acquisition, confidence, and increased engagement with the academic text. Emotional profits especially frustration alleviation and alleviation of worry towards new words belong to educationally equal significance to direct cognitive advantages, yielding the psychological ease that maintains motivated reading. But good does not come for nothing. Lookup intercepts reading and is a cognitive burden, causing interface integration to be a design imperative vocabulary support is best provided when it is integrated with the reading environment and not a separate application. Another similar problem is usage habit: students use digital aids reactive at the moment of necessity but seldom apply to review and reinforcement functions that transform receive up to long-term vocabulary. To bring the full potentials of these tools to actual uses, it needs interface designs that abate the tendency to cognitive interruption, pedagogical models that lead the learner towards proper usage, and institutionalization committed to fair digital provision.

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Appendix A

Research Questionnaire

Survey on Influence of Digital Dictionaries and Vocabulary Apps on Reading Fluency

Introduction

Respected Participant,

We are students of BSCS (Roll Numbers: 233523, 233539, 233559, 233577) at Air University Multan Campus, conducting a research study on the Influence of Digital Dictionaries and Vocabulary-Building Applications on Reading Fluency. This study investigates how the use of digital dictionaries and vocabulary applications affects reading fluency, vocabulary acquisition, comprehension, motivation, and cognitive experience during reading among university students. Your participation is highly valuable and will contribute meaningfully to academic research. All information collected will remain strictly confidential and used solely for research purposes. No personal identity will be disclosed.

Consent Statement

- Participation in this study is entirely voluntary.
- All responses are confidential and anonymous.
- You may withdraw at any time without any penalty or consequence.
- There is no risk, harm, or academic penalty associated with your responses.
- Data collected will be used solely for academic research purposes.

( ) I have read the above information and agree to participate in this study.

Section A: Demographic Information

Please fill in or select the option that best applies to you.

1. Age	**( ) 15–17 ( ) 18–20 ( ) 21–23 ( ) 24–26 ( ) 27 or above**
2. Gender	( ) Male ( ) Female ( ) Prefer not to say
3. English Proficiency	( ) Beginner ( ) Elementary ( ) Intermediate ( ) Upper-Intermediate ( ) Advanced
4. Duration of Use	( ) Never used ( ) < 6 months ( ) 6 months–1 year ( ) 1–2 years ( ) > 2 years
5. Primary Device	( ) Smartphone ( ) Tablet ( ) Laptop/PC ( ) Multiple Devices

6. Program / Semester:
7. Which digital dictionary / vocabulary app do you use most frequently?

Section B: Awareness and Usage Patterns

Scale: 1 = Never | 2 = Rarely | 3 = Sometimes | 4 = Often | 5 = Always

Statement	1	2	3	4	5
B1. I use a digital dictionary or vocabulary app when I encounter an unfamiliar word while reading.	O	O	O	O	O
B2. I consult digital dictionaries to check word pronunciation before reading aloud.	O	O	O	O	O
B3. I use vocabulary apps as part of my daily or weekly study routine.	O	O	O	O	O
B4. I look up words in a digital dictionary rather than skipping over	O	O	O	O	O

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unknown words in a text.					
B5. I revisit words I have looked up previously using my app's history or saved-word feature.	O	O	O	O	O
B6. I use vocabulary apps to prepare for reading assignments in class.	O	O	O	O	O

Section C: Vocabulary Acquisition and Retention
Scale: 1 = Strongly Disagree | 2 = Disagree | 3 = Neutral | 4 = Agree | 5 = Strongly Agree

Statement	1	2	3	4	5
C1. Digital dictionaries help me learn the exact meaning of new words quickly.	O	O	O	O	O
C2. Vocabulary apps help me remember newly learned words for a longer period of time.	O	O	O	O	O
C3. Example sentences provided in digital dictionaries help me understand how words are used in context.	O	O	O	O	O
C4. Flashcard features in vocabulary apps improve my ability to retain new vocabulary.	O	O	O	O	O
C5. I notice an increase in the number of words I know since I started using vocabulary apps.	O	O	O	O	O

Section D: Impact on Reading Speed and Fluency
Scale: 1 = Strongly Disagree | 2 = Disagree | 3 = Neutral | 4 = Agree | 5 = Strongly Agree

Statement	1	2	3	4	5
D1. My reading speed has improved since I began using digital dictionaries and vocabulary apps.	O	O	O	O	O
D2. I can read English texts more fluently now because I recognize more words.	O	O	O	O	O
D3. Stopping to look up words in a digital dictionary disrupts my reading flow.	O	O	O	O	O
D4. Using vocabulary apps regularly has reduced the number of times I pause while reading.	O	O	O	O	O
D5. I feel more confident reading longer texts since expanding my vocabulary through apps.	O	O	O	O	O
D6. My reading becomes smoother when I have previously studied the vocabulary of a topic using a vocabulary app.	O	O	O	O	O

Section E: Reading Comprehension Support
Scale: 1 = Very Poor | 2 = Poor | 3 = Average | 4 = Good | 5 = Excellent

Statement	1	2	3	4	5
E1. How well do digital dictionaries help you understand the overall meaning of a passage?	O	O	O	O	O
E2. How would you rate the quality of definitions provided by your preferred digital dictionary?	O	O	O	O	O
E3. How effective are vocabulary apps in helping you answer comprehension questions about texts?	O	O	O	O	O
E4. How well do digital dictionaries explain multiple meanings of a single word in context?	O	O	O	O	O

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E5. How would you rate your overall reading comprehension since using digital dictionaries and apps regularly?	O	O	O	O	O

Section F: Motivation and Confidence in Reading
Scale: 1 = Strongly Disagree | 2 = Disagree | 3 = Neutral | 4 = Agree | 5 = Strongly Agree

Statement	1	2	3	4	5
F1. I feel more motivated to read English texts because vocabulary apps reduce word-level anxiety.	O	O	O	O	O
F2. Using digital dictionaries increases my confidence in understanding academic or formal texts.	O	O	O	O	O
F3. I am less afraid of encountering difficult vocabulary when reading because I can look words up instantly.	O	O	O	O	O
F4. Vocabulary apps make reading feel like a more rewarding and achievable activity.	O	O	O	O	O
F5. I feel a sense of progress in my English reading skills because of my use of vocabulary apps.	O	O	O	O	O
F6. Digital dictionaries reduce the frustration I experience when reading challenging material.	O	O	O	O	O

Section G: Challenges and Limitations
Scale: 1 = Never | 2 = Rarely | 3 = Sometimes | 4 = Often | 5 = Always

Statement	1	2	3	4	5
G1. I find that looking up too many words interrupts my focus while reading.	O	O	O	O	O
G2. I rely so heavily on digital dictionaries that I struggle to read without them.	O	O	O	O	O
G3. Vocabulary app notifications or pop-ups distract me during reading sessions.	O	O	O	O	O
G4. I experience difficulty retaining the meaning of a word even after looking it up multiple times.	O	O	O	O	O
G5. Internet connectivity issues prevent me from using digital dictionaries effectively during reading.	O	O	O	O	O