



## Investigating writers' attitudes toward software use in Bangla scholarly research works: A study in Pabna district, Bangladesh

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**Abstract:** English research extensively uses technology for error checking and citation, a support largely unavailable for Bangla research, hindering quality assessment against global benchmarks. This study explores Bangla-writing researchers' attitudes toward the use of online technology in their scholarly works, measure the marginal effects of using online technology in Bangla scholarly works, and identify essential contributors to the use of online technology. A questionnaire survey, employing convenience sampling, was conducted among students and teachers ( $n = 177$ ) in Pabna city. To empirically assess the factors influencing writing quality, a logit model was employed. The results indicate that online technologies, workshop on use of online technologies, and natural language processing tools are statistically significant and have the potential to improve Bangla

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scholarly writing. However, realizing this potential necessitates addressing current challenges in the proper and efficient usage of available software and exploring the development and adoption of more tailored technological solutions for the Bangla scholarly community.

**Keywords:** Technology adoption, Software usage, Research quality, Logit model, Learners' attitudes.

## **Introduction**

In the increasingly digital landscape of research, online technologies have emerged as indispensable tools, significantly enhancing the efficiency and quality of scholarly works. English-language researchers get benefit from a rich ecosystem of sophisticated tools designed to streamline every stage of the research process, including grammar and spell-checking, citation management, and plagiarism detection. These tools contribute significantly to the clarity, professionalism, and integrity of their published works. For instance, grammar and spell-checkers goes beyond simple error detection, offering nuanced suggestions for style, conciseness, and tone. This not only helps catch subtle linguistic errors but also significantly elevates the overall quality of writing, ensuring clarity and professionalism in published works. Furthermore, citation management software automates the often tedious and error-prone process of formatting bibliographies and in-text citations. This software drastically reduces the time researchers spend on administrative tasks and minimizes the potential for inaccuracies in referencing, a fundamental cornerstone of academic integrity. Crucially, plagiarism detection software provides a vital safeguard against academic misconduct. The extensive development and refinement of these tools in English

reflect the language's dominance in global academic publishing, fostering a highly effective support system for its researchers.

In stark contrast, the lack of robust technological assistance poses a critical challenge for Bangla-writing researchers, despite their significant intellectual output within Bangladesh and beyond. While Bangla-writing researchers contribute to a wide array of important topics through their work, they often lack the same level of digital support. Recognizing this critical gap, we explore the attitudes of Bangla-writing researchers toward the use of online technology in their work. Understanding their perception is a crucial first step in developing and implementing language-specific tools. Such tools are essential to bridge online-supported writing software and empower Bangla-writing researchers to achieve global benchmarks of research quality and integrity.

### **Identification of Research Subject**

In today's volatile, uncertain, complex, and ambiguous (VUCA) society, rigorous research has become indispensable. It acts as a crucial driver of societal and civilisational progress by exploring unanswered questions, thereby enhancing human well-being and generating knowledge. The effective dissemination of these research findings relies heavily on the principles of scholarly works. Producing high-quality scholarly works, encompassing various formats like journal articles, books, and reports, necessitates a value-free, unbiased, and scientifically structured approach, adhering to a consistent format and style that ensures clarity and precision.

Maintaining the integrity and quality of scholarly works hinge on several critical elements. Manuscripts must be meticulously prepared and free from errors such as misspellings, plagiarism,

and improper paraphrasing. Moreover, the consistent and accurate application of established citation and referencing styles – the American Psychological Association (APA), Modern Language Association (MLA), Harvard, Chicago, Oxford, Turabian, Modern Humanities Research Association (MHRA), Institute of Electrical and Electronics Engineers (IEEE), International Organisation for Standardisation (ISO) 690, Gosudarstvennyy Standard (GOST), Slovenski Institut za Standardizacijo (SIST) 02, and Vancouver- is paramount. Writing high-quality research papers is a complex endeavor, fraught with potential pitfalls ranging from misspellings, grammatical errors, verbose language and inconsistent citations to plagiarism. These impediments can significantly detract from the clarity, credibility, and overall impact of scholarly works.

Misspellings and grammatical errors represent foundational yet highly impactful flaws in a manuscript. While seemingly minor, these can severely undermine a manuscript's professionalism and the author's credibility. As Gopen and Swan (1990) highlight “the reader's initial impression of a text is often heavily influenced by its surface features” (54) meaning even a few errors can create an impression of carelessness or lack of rigor. Such errors distract readers, obscure meaning, and can even alter the intended message, making it difficult for the audience to focus on the research's substantive content. For instance, a misplaced comma or a misused homophone can completely change the interpretation of a sentence, leading to confusion and miscommunication of complex scientific ideas.

Beyond simple errors, verbose language poses another significant challenge. Research papers are fundamentally designed to convey information precisely and concisely. Overly wordy sentences, redundant phrases, and unnecessary jargon can render a paper dense and difficult to read, effectively

burying key findings and arguments in excessive prose. Strunk and White (2000) famously advise “omit needless words” (23) emphasizing that conciseness is a hallmark of good writing. When authors use too many words to express an idea, it not only wastes the reader’s time but also dilutes the impact of their research, making it less engaging and harder to digest. This often leads to readers skimming or abandoning the paper, reducing the paper’s potential influence within the academic community.

Adding to the integrity challenge, inconsistent citations can significantly diminish a paper’s quality and credibility. Academic integrity demands that all sources be accurately and consistently acknowledged according to a specific citation style. Inconsistencies – such as missing citations, incorrect formatting, or a mix of different styles – create confusion for readers trying to locate the original sources. More critically, they raise questions about the author’s attention to detail and their commitment to proper academic protocols. As the Purdue Online Writing Lab (n.d.) frequently emphasizes, proper citation is essential for avoiding plagiarism and for giving credit to sources. When citations are inconsistent, it not only makes verification difficult but also implies a lack of rigor in the research process itself, potentially undermining the validity of the paper’s claims.

Plagiarism stands out as a severe form of research and scholastic misconduct. Often linked to replication and imitation, plagiarism has long been recognized as the “theft of intellectual property” (Ibrahim et al., 2025). The advent of easily accessible online resources, extensive databases, advanced telecommunications, and vast library collections has revolutionized research. Yet, this very accessibility, coupled with the widespread availability of diverse information sources, has inadvertently amplified the problem of plagiarism for publishers, academics, and researchers. Drisko (2023) defines plagiarism

through various actions, including submitting another's work as one's own and using ideas or words without proper attribution. Specific examples include failing to use quotation marks for direct quotes, misrepresenting source information, altering words while keeping the original sentence structure without citation, and extensively copying material even with citation. Plagiarism manifests in multiple forms, each posing a unique threat to academic integrity, such as direct copying, presenting another's idea as original, self-plagiarism, improper paraphrasing, and misuse of artistic works or computer code (Mulenga & Shilongo, 2024).

A fundamental challenge for writers in producing plagiarism-free research papers arises from the multifaceted nature of plagiarism itself, encompassing accidental, unintentional, intentional, AI-driven, and self-plagiarism. Furthermore, insufficient knowledge of proper citation and referencing techniques significantly elevates the risk of plagiarism, thereby compromising the merit and quality of scholarly works globally.

To mitigate misspellings, grammatical errors, verbose language and inconsistent citations, and plagiarism free writing practices, English language research often benefits from substantial technological support, including grammar and spelling checkers (e.g., Grammarly, Ginger), AI-driven writing detection software (e.g., Quetext AI Detector, Zero GPT), and plagiarism/paraphrasing detection tools (e.g., iThenticate, Turnitin). Citation and referencing software (e.g., Mendeley, Zotero) further aids in accurate attribution.

While robust technological solutions exist to mitigate common issues in academic writing, their availability and sophistication are not uniform across all languages, creating a notable digital divide, particularly for Bangla-writing researchers. Specifically,

comprehensive technological assistance - encompassing tools for grammar and spell-checking, citation management, and plagiarism detection - is often scarce for Bangla-written research papers. This disparity is particularly significant given the wide range of important topics explored by Bangla writing researchers and documented in Bangla. Consequently, the limited availability of robust technological tools makes it considerably more challenging for Bangla-writing researchers to detect plagiarism, ensure linguistic accuracy, and ultimately uphold the quality of their manuscripts according to ethical, scientific, and global standards. This unequal access to essential tools creates a significant barrier to equitable participation and recognition in the global academic landscape. In this viewpoint, it is imperative to introduce online technology developed based on the preferences and perceptions of Bangla-writing researchers. Such tailored solutions are crucial not only to help maintain global standards in Bangla writing but also to facilitate the dissemination of unexplored facts and findings from ongoing and future research works in the Bangla language to international readers, researchers, and policymakers.

### ***Objectives of the research***

The objectives of the study are to explore Bangla-writing researchers' attitudes toward the use of online technology in their scholarly works, measure the marginal effects of using online technology in Bangla scholarly works, and identify essential contributors to the use of online technology.

### ***Research rationale***

Although research on plagiarism and academic integrity is widespread, studies specifically examining the unique

challenges within the Bangla language academic writing context remain less common, particularly concerning the scarcity of online technological support. This study addresses this under-researched area by highlighting the distinct difficulties faced by Bangla writing researchers due to the limited availability of language-specific tools crucial for ensuring academic integrity. Furthermore, it explicitly links this scarcity of online technological resources to the potential compromise of ethical standards and the overall quality of Bangla scholarly works. Consequently, this work could pave the way for future research focused on exploring potential solutions to these identified challenges, such as the development of Bangla-specific plagiarism detection software, the implementation of enhanced training on citation practices within Bangla academic settings, and the adaptation of existing online technologies for the Bangla language.

## **Research Methodology**

### ***Study area***

Pabna city presents a compelling study site, primarily due to its robust and diverse educational ecosystem. This thriving academic environment is home to several key institutions, each contributing uniquely to the intellectual landscape. Among these are Pabna University of Science and Technology (PUST), Government Edward College (GEC), Shahid Bulbul Government College (SBGC), Pabna Government Women College (PGWC), Pabna College, Shaheed M Monsur Ali College, Imam Ghazali College, and Islamia College.

Each of these institutions has dedicated departments across a spectrum of disciplines, fostering the intellectual development of students from undergraduate to doctoral levels. A defining characteristic of the academic culture within these departments



is the active involvement of both faculties and students in research. These scholarly pursuits culminate in a variety of Bangla publications and research outputs. These include annual magazines showcasing departmental activities, journal articles presenting focused research findings, term papers exploring specific topics, and comprehensive thesis or dissertations for MPhil and Ph.D. research conducted both within and outside the district. Furthermore, the development of concept notes provides a preliminary platform for outlining research ideas. Significantly, the creation of these scholarly works largely adheres to established traditional writing conventions.

### ***Data collection technique***

This study employed a quantitative research method (QRM) design to gain a comprehensive understanding of students', teachers', and researchers' attitudes towards online technology in scholarly writing. Specifically, the research integrated quantitative survey data obtained through questionnaire.

For clarity and ease of understanding, a two-page, semi-structured questionnaire was utilized to gather comprehensive insights into respondents' perceptions and preferences regarding proposed online technologies for Bangla scholarly writing. This questionnaire, originally formatted in English, was meticulously translated into Bangla and administered to respondents during face-to-face interviews. The questionnaire was divided into two main parts. Part one covered general information. This section collected demographic data from respondents, including their age (measured in years), gender (coded as 1 for male and 0 for female), educational attainment (measured as stage of educational level), and professional status (coded as 1 for teacher and 0 for student). Part two covered online technologies and research writing tools. This section explored respondents'

engagement with and utilization of specific software and applications relevant to scholarly writing. These tools included grammar and spelling checkers, plagiarism checkers, AI-driven concept detectors, citation and referencing software, natural language processing (NLP) tools, and workshop on use of online technologies in Bangla scholarly works. Responses to most of the survey questions in this part were captured using dummy variables on an ordinal scale, with “agree” coded as 1 and “disagree” coded as 0.

### ***Sampling and survey techniques***

This study investigated the perception of online technology and software usage in scholarly works among 177 randomly selected respondents from PUST and GEC in the Pabna district. Data were collected through on-site, convenient surveys conducted between November 13<sup>th</sup> and 18<sup>th</sup>, 2023.

While efforts were made to ensure random selection of respondents through convenient sampling technique, the possibility of sampling error exists. To mitigate this, the surveys were administered by the authors and ten trained enumerators (students of GEC). Prior to participation, all respondents were informed about the study’s aim, rationale, and objectives.

Despite lacking prior experience with citation, referencing, and plagiarism software, a significant majority of respondents indicated a desire to use these tools when writing scholarly works, believing it would increase the scientific rigor of their output.

### ***Model specification***

We define our outcome variable, the adoption of online technology for scholarly writing in Bangla ( $y_i$ ), as a binary

variable. It is coded as 1 if respondent  $i$  expresses willingness to adopt online technology, and 0 otherwise. The general form of the latent variable regression model underlying our analysis is:

$$y_i^* = x_i\beta + \epsilon_i \quad (1)$$

Where  $y_i^*$  represents the unobservable latent variable indicating the propensity to adopt online technology for scholarly writing,  $x_i$  is a vector of explanatory attributes for respondent  $i$ ,  $\beta$  is a vector of parameters to be estimated, and  $\epsilon_i$  is the error term.

Since  $y_i^*$  is unobservable, we instead observe the binary outcome defined as:

$$y_i = 1 \text{ if } y_i^* > 0$$

$$y_i = 0 \text{ if } y_i^* \leq 0$$

The probability that a respondent is willing to adopt online technology for scholarly writing in Bangla is thus:

$$P(y_i = 1) = P(y_i^* > 0) = P(\dot{x}_i\beta + \epsilon_i > 0) = P(\epsilon_i > -\dot{x}_i\beta) \quad (2)$$

If the distribution of the error term is symmetric around zero, we can write:

$$P(\epsilon_i > -\dot{x}_i\beta) = 1 - F(-\dot{x}_i\beta) = F(\dot{x}_i\beta) \quad (3)$$

Where  $F$  is the cumulative distribution function (CDF) of the error term.

For the logit model, we specifically assume that the error term follows a logistic distribution. The CDF of the logistic distribution is given by  $F(z) = 1 + \exp(-z)$ . Therefore, the probability that the  $i^{th}$  respondent is willing to adopt online technology for scholarly writing in Bangla is:

$$P(y_i = 1) = \frac{\exp(\dot{x}_i\beta)}{1 + \exp(\dot{x}_i\beta)} \quad (4)$$

The term  $\dot{x}_i\beta$  is a linear function of  $n$  explanatory variables ( $x_{ij}$ ), and their corresponding parameters ( $\beta_j$ ):

$$\dot{x}_i\beta = \beta_0 + \beta_{1x_{i1}} + \beta_{2x_{i2}} + \beta_{3x_{i3}} + \dots + \beta_{nx_{in}} \quad (5)$$

If  $p_i = P(y_i = 1)$  be the probability that the  $i^{th}$  respondent is willing to adopt software. Then the probability of not adopting software ( $1 - p_i$ ) is:

$$P(y_i = 0) = 1 - p_i = 1 - \frac{\exp(\dot{x}_i\beta)}{1 + \exp(\dot{x}_i\beta)} = \frac{1}{1 + \exp(\dot{x}_i\beta)} \quad (6)$$

The odds ratio then:

$$\frac{P(y_i=1)}{P(y_i=0)} = \frac{p_i}{1-p_i} = \exp(\dot{x}_i\beta) \quad (7)$$

Taking the natural logarithm of the odds ratio yields the logit model:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \dot{x}_i\beta \quad (8)$$

The marginal effect for a continuous explanatory attribute  $x_{ik}$  can be calculated using the derivative:

$$\frac{\delta P(y=1)}{\delta x_{ik}} = \frac{\exp(\dot{x}_i\beta)}{(1 + \exp(\dot{x}_i\beta))^2} \beta_k = P(y_i = 1)[1 - P(y_i = 1)]\beta_k \quad (9)$$

This derivative provides an approximation of the change in probability for a small change in the continuous variable. For a dummy variable representing a change from 0 to 1, the marginal effect is the discrete change in probability:

$$P\left(y_i = \frac{1}{x_{ik}} = 1\right) - P\left(y_i = \frac{1}{x_{ik}} = 0\right) \quad (10)$$

To understand how changes in the explanatory attributes of interest influence a respondent's likelihood of adopting online technology for scholarly writing in Bangla, we calculated marginal effects, adjusting the method appropriately for continuous and dummy variables. When considering policy implications or decisions, we adopted a conventional significance level based on the  $p$ -value, such as a  $p$ -value of 1% ( $\leq 0.01$ )\*, 5% ( $\leq 0.05$ )\*\* and 10% ( $\leq 0.10$ )\*\*\*. All descriptive statistics and the logit regression model results were estimated using STATA 18.5 software.

## Literature Review

### ***Role of online technology in enhancing scholarly writing: A global perspective with specific relevance to Bangla***

The advent and pervasive integration of online technology have undeniably ushered in a transformative era for academic writing globally (Mahdi, 2023). This revolution has fundamentally reshaped the landscape of scholarly output, leading to significant enhancements in both the quality and accessibility of research findings (Mogaji, 2024). Indeed, online technology has become an indispensable ally for researchers and academics worldwide, streamlining intricate organisational tasks, facilitating meticulous editing processes, and enabling wider and more efficient dissemination of knowledge (Mohanty et al., 2024). Sultana (2022) astutely argues that this transformative power holds particular significance for languages such as Bangla, where the integration of digital tools offers potent solutions to overcome unique linguistic complexities and address inherent resource limitations that might otherwise impede scholarly progress. Specifically, the development and strategic application of language-specific technological instruments – including sophisticated spell checkers capable of recognizing the nuances of Bangla orthography, advanced grammar correction software tailored to its grammatical structures, and robust plagiarism detection systems designed to identify textual similarities in Bangla – have played a pivotal role in bolstering the accuracy, integrity, and overall quality of Bangla scholarly writing. Consequently, these tools not only aid in refining the linguistic aspects of research papers but also contribute to upholding ethical standards within the academic community (Khalifa & Albadawy, 2024; Silver et al., 2023).

***Challenges in Bangla scholarly writing: Navigating linguistic nuances and technological gaps***

Despite the burgeoning influence of online technology and its considerable potential to elevate Bangla scholarly writing, the field continues to grapple with distinct and persistent obstacles. A primary and significant challenge stems from the limited availability of highly sophisticated NLP tools specifically engineered to comprehend and process the intricate grammatical rules, morphological variations, and semantic subtleties inherent in the Bangla language (Khurana et al., 2023; Khan et al., 2023). This scarcity of advanced NLP capabilities, as Zhao (2024) reported, inherently hinders the development of more effective writing assistance tools. Furthermore, this technological limitation is compounded by the relative absence of universally accepted and rigorously enforced standardized academic writing conventions within the Bangla scholarly community, a point consistently argued by Rahman et al. (2024). The lack of clear guidelines regarding formatting, citation styles specific to Bangla resources, and overall structural expectations can lead to inconsistencies and a diminished sense of uniformity in scholarly outputs (Aktar & Islam, 2023). Adding to these complexities is the persistent digital divide, which affects access to technology and reliable internet connectivity in certain segments of the Bangla-speaking academic community. This disparity, coupled with insufficient training and support in the effective utilisation of available technological tools (Timotheou et al., 2023), significantly impedes the widespread adoption and optimal use of these resources in routine academic practices. Ultimately, these interconnected challenges collectively create substantial barriers that can hinder the production and dissemination of high-quality Bangla scholarly works.

### ***Technological innovations for Bangla: Progress and future directions***

In recent years, there have been encouraging and noteworthy technological innovations specifically aimed at addressing the unique challenges faced by Bangla scholarly writing (Rahman et al., 2024). The development of Bangla Optical Character Recognition (OCR) systems, which enable the conversion of scanned or printed Bangla text into digital formats, and the creation of machine translation tools designed to translate between Bangla and other languages, have significantly facilitated the digitalisation and accessibility of Bangla textual resources (Sen et al., 2022). These advancements have opened up new avenues for research and knowledge sharing. In this context, the insightful work of Iqbal et al. (2020) strongly emphasized the critical importance of a multi-pronged approach involving the development of even more advanced and nuanced NLP tools tailored specifically for the Bangla language, the proactive promotion of digital literacy among researchers and academics to enhance their ability to leverage technology effectively, and the crucial establishment of policy-level support within academic institutions to foster a culture of technology integration in all aspects of scholarly works. Such concerted efforts are deemed essential for cultivating a truly technology-centric ecosystem that supports the production of high-quality Bangla scholarly writing (Kayes, 2024). Furthermore, the promising emergence of innovative platforms that seamlessly integrate Bangla typing software with a range of academic writing assistance features, such as contextual vocabulary suggestions and basic grammatical checks, demonstrates considerable potential in bridging the existing gap between the theoretical possibilities offered by technology and the practical application of these tools in the daily writing practices of Bangla scholars (Mamun et al., 2024).

### ***Global perspectives and local adaptations: Contextualizing technology***

Drawing upon a wealth of research conducted across the globe, it becomes evident that the effective integration of technology in any specific context necessitates a strong emphasis on contextualisation (Nguyen & Tull, 2022). This means that technological solutions must be carefully adapted and tailored to meet the unique local requirements, taking into account the specific linguistic features, cultural nuances, and established academic practices of the target language and community (Galla, 2016). For Bangla scholarly writing, this principle underscores the critical need to move beyond simply adopting generic technological tools developed for other languages (Islam et al., 2021). Instead, it necessitates a focused effort on adapting global best practices in academic writing technology to align seamlessly with the intricate linguistic structures, idiomatic expressions, and cultural sensitivities inherent in the Bangla language (Rahman et al., 2024). To ensure the successful, meaningful, and sustainable integration of technology in Bangla scholarly writing, collaborative and interdisciplinary partnerships among linguists who possess deep understanding of the language, technologists who can develop and adapt relevant tools, and educators who can facilitate effective training and adoption are absolutely indispensable (Zhong et al., 2024). Such collaborations can pave the way for the creation of truly effective and culturally appropriate technological solutions that empower Bangla scholars and enhance the global reach and impact of their research.

Given the limited scholarly attention to the unique difficulties and the scarcity of technological support for academic writing



in the Bangla language, particularly concerning plagiarism and academic integrity, our study contributes to minimizing this research gap by investigating the extent of the problem and identifying potential solutions.

### **Research Theoretical Framework: Theory of Change**

While the theory of change (ToC) has garnered significant attention in recent decades, its foundations were laid much earlier, representing an evolution of thinking in program planning and evaluation over the past half-century (Khan et al., 2021). The emergence of ‘Program Theory’ in the 1960s marked a crucial step, emphasizing the need for program planners to clearly articulate the connections between inputs and intended outcomes, along with the underlying assumptions driving the program’s mechanisms (Miao & Nduneseokwu, 2025). However, the term ‘Theory of Change’ as it is widely understood today gained prominence in the 1990s through the work of the Aspen Institute Roundtable on Community Change (Hatumimana & de Dieu Dushimimana, 2024). This group addressed the complexities of evaluating social change initiatives where goals and pathways were often ill-defined.

This historical context, highlighting the importance of clearly articulated pathways to change, directly motivates our current research. We observe that technology use in Bangla written research work in Bangladesh is a relatively new and complex undertaking. The challenges posed by copy-pasting, typos, grammatical errors, and improper referencing significantly impede the quality of scholarly works. Recognizing this, writers, scholars, and policymakers in the context of current Bangla scholarly practices widely acknowledge the potential of

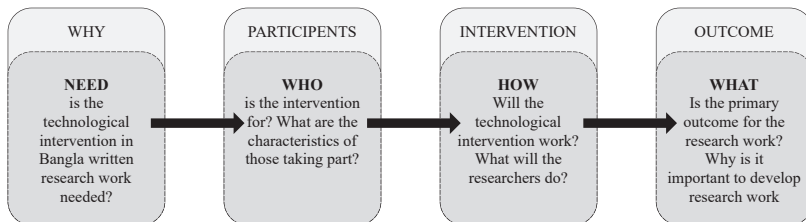
supportive technologies to enhance writing quality and prevent plagiarism. We posit that a ToC framework can offer valuable guidance to native researchers in various countries, including Bangladesh, to elevate the quality of their written work.

In its simplest form, a ToC explains the ‘why’ ‘who’ ‘how’ and ‘what’ of a program’s success. For the purpose of our study, we define a ToC as a set of online technology-supported writing initiatives undertaken by researchers. This framework explicitly outlines the incremental steps leading to plagiarism-free writing and establishes the link between these activities and the broader outcomes of the intervention.

It’s important to acknowledge the diverse perspectives surrounding the concept and application of a ToC. These range from viewing it as a purely technical tools to understanding it as a more nuanced approach for navigating change in unpredictable environments. Our study adopts the latter perspective, assessing the perceptions of researchers engaged in Bangla writing towards the integration of technology in their research. This can be viewed as an adaptive process where researchers’ experiences and feedback shape the implementation and refinement of technology-supported writing initiatives.

Building upon Stein and Valters’ (2012) comprehensive review of practitioner-oriented literature, we recognize four fundamental purposes of a ToC: strategic planning, monitoring and evaluation, describing program activities and achievements, and fostering learning. While acknowledging the importance of all four, our study strategically concentrates on three key areas: strategic planning, impact assessment (encompassing the monitoring and evaluation of results), and describing empirically supported outcomes.

Our study covers (i) strategically plans for the introduction and integration of various online technologies to support Bangla written research work, including the research carried out by researchers in the Bangla language. This strategic plan incorporates a range of attributes, including grammar and spelling checkers, AI-driven concept checkers, plagiarism detection tools, citation and referencing software, NLP tools, and workshop on use of online technologies in Bangla scholarly works tailored for research projects and higher studies; (ii) assess the impact of online technology adoption on Bangla scholarly works by providing a clear and empirically supported description of the observed effects and changes resulting from the implementation of these technologies; and (iii) justify, based on the assessed impacts, the potential role of technology adoption in informing policy design aimed at enhancing the quality and integrity of Bangla scholarly output. Our strategic selection of these technological attributes, informed by a review of over 60 journal articles published between 2019 and 2025, is intended to provide practical guidelines for promoting good research practices (see Fig. 1 for more details).



**Figure 1** Framework for Theory of Change

**Source:** Prepared by the authors, 2025

## **Results and Research Findings**

### ***Descriptive statistics***

Based on the responses of 177 individuals who shared their perceptions regarding our proposed attributes, we calculated the socio-demographic (SD) characteristics of the respondents. The analysis includes age and educational attainment, detailing the maximum, minimum, mean, and standard deviation for each variable.

The ages of the respondents ranged from 20 to 51 years, with a mean age of 25.30 years and a standard deviation of 12.50 years, indicating a moderate spread in the age distribution. Educational attainment, measured on a scale where higher values denote more advanced education, ranged from 16 to 20, with a mean of 17.41 and a standard deviation of 5.04. This suggests that the respondents generally had a high level of education, with some variability within the group.

In terms of occupation and academic engagement, 12 respondents (6.77%) were teachers, and 4 respondents (2.26%) were actively involved in MPhil and Ph.D. research at leading public universities in Bangladesh. The majority of the respondents, 161 individuals (90.96%), were students at the graduate and undergraduate levels. The gender distribution of the sample consisted of 58 female respondents (32.77%) and 119 male respondents (67.23%). A detailed compilation of the descriptive statistics for these SD characteristics can be found in Table 1.

**Table 1** Descriptive statistics (*n*= 177)

Variable	Maximum	Minimum	Mean	Standard deviation
Age	51	20	25.30	12.50
Educational attainment	20	16	17.41	5.04

**Source:** Survey data, 2023

***Econometric model estimation***

Table 2 presents the econometric findings derived from a logit regression model, where we assume all proposed attributes are random parameters following a normal distribution. To ensure the robustness and reliability of this model, we evaluated several key indicators. Firstly, a Log-likelihood (LL) value approaching 0 is considered indicative of a good model fit (Louviere et al., 2000). Secondly, Pseudo R-squared values exceeding 0.2 suggest a satisfactory level of explanation (Rouwendal & Meijer, 2002). Finally, the accurate estimation of these parameters is critically dependent on the implementation of appropriate coding strategies, including numerical attributes, effects coding, and dummy coding.

**Table 2** Logit model estimates of parameters

Attributes	Coefficient	Standard error	<i>P</i> >   <i>Z</i>
grammar and spelling checkers	0.648*	0.326	0.001
plagiarism checkers	0.136**	0.046	0.030
AI-driven concept checkers	0.007	0.006	0.079
citation and referencing software	0.016***	0.159	0.091
natural language processing tools	0.007	0.002	0.185

workshop on use of online technologies	0.010*	0.386	0.000
constant	0.337*	0.471	0.000
Observations	177		
Log likelihood	-67.051872		
Pseudo $R^2$	0.3770		
P>chi <sup>2</sup>	0.000		

*Note.* \*, \*\* and \*\*\* indicate statistically significant at 1%, 5% and 10% respectively.

**Source:** Survey data, 2023

The logit model results indicate that the majority of the proposed attributes are statistically significant at conventional levels and exhibit the anticipated signs, with the exception of AI-driven concept checkers and NLP tools. For instance, the positive coefficient of grammar and spelling checkers suggests that, holding other factors constant, scholarly works with strong grammar, the absence of typos, and appropriate spelling is less likely to be chosen. This finding aligns with the author guidelines of journal articles and other scholarly publications worldwide, which emphasize these elements as necessary for standard writing in any language. Furthermore, the positive coefficients of the other statistically significant attributes imply that incorporating these features into Bangla scholarly works enhances their perceived credibility.

We measured the marginal effects to better understand the impact of a one-unit increase in each statistically significant attribute on the outcome variable. Table 3 outlines these marginal effects for all explanatory variables except the insignificant attributes, such as AI-driven concept detector and NLP tools.

**Table 3** Marginal effects of the explanatory variables

Attributes	$dy/dx$	Standard error	Z	$P >  Z $
grammar and spell checkers	0.028***	0.053	2.38	0.00
plagiarism checkers	0.033*	0.033	1.18	0.07
citation and referencing software	0.286***	0.211	0.13	0.36
workshop on use of online technologies	0.199**	0.193	0.35	0.32
<i>Constant</i>	0.030	0.073	1.16	0.000

*Note.* \*, \*\* and \*\*\* indicate statistically significant at 1%, 5% and 10% respectively.

**Source:** Survey data, 2023

Marginal effects quantify the change in the predicted probability of a scholarly works being chosen for a one-unit increase in the respective explanatory variable, while holding all other variables constant. The marginal effect of grammar and spell checkers is 0.028. Given that a higher value of grammar and spell checkers likely indicates poorer grammar, spelling, and clarity, this suggests that a one-unit more use in grammar and spelling checkers is associated with a 0.028 increase in the probability of the work being chosen. The marginal effect for plagiarism checkers 0.033. Assuming a higher value of plagiarism checkers represents a clearer structure, a one-unit more use in plagiarism leads to a 0.033 increase in the predicted probability of the scholarly works being chosen, implying that better-organized works are slightly more likely to be selected. The marginal effect for citation and referencing software is 0.286. If a higher citation and referencing software value reflects greater clarity in the research's significance, this suggests that a one-unit more use in citation and referencing software increases

the likelihood of the work being chosen by 0.286, emphasizing the importance of clearly articulating the research's impact. Workshop on use of online technology in Bangla scholarly works has a marginal effect of 0.199. If a higher value of such workshop indicates a clearer presentation of the research workflow, a one-unit increase in *pww* increases the probability of the work being chosen by 0.199, suggesting that well-defined methodologies are favored. Finally, the marginal effect of the constant term is 0.030. This represents the predicted change in probability when all other explanatory variables are equal to zero.

The observation that “a higher usage increases the likelihood of a work being chosen” for grammar and spelling checkers software appear counterintuitive at first glance. This seems to contradict the well-established emphasis within academic literature, as highlighted by Strunk & White (2000), Becker (2020), and Shi (2021), on the fundamental importance of clear and error-free writing for effective scholarly communication, accurate idea transmission, and author credibility. Without a clear understanding of how the use of this software was presented to respondents, interpreting this finding remains speculative. Perhaps higher usage indicates a greater effort towards refinement, even if errors still persist, or it might reflect a perception that using such tools signifies diligence. Further investigation into the *context* of this software usage, rather than just the frequency, would be beneficial to reconcile this finding with established norms.

In contrast, the positive association of plagiarism checkers software usage with the likelihood of a work being chosen strongly aligns with the increasing emphasis on academic integrity within higher education and scholarly publishing. As supported by observational studies and the work of Mulenga and Shilongo (2024), Macfarlane et al. (2014), and Drisko (2023),



originality and proper attribution are cornerstones of research ethics. The perceived value of using plagiarism detection tools likely reflects an understanding of their role in upholding these standards.

Similarly, the positive influence of citation and referencing software underscores the critical role of proper citation in academic work. Lindahl and Grace (2018) and Razlan et al. (2024) rightly point out that accurate and consistent referencing is essential for acknowledging sources, preventing plagiarism, building upon existing knowledge, and enhancing research transparency and credibility. The finding that higher usage of such software correlates with a greater likelihood of a work being chosen suggests that the perceived focus on or quality of citation and referencing, potentially facilitated by these tools (Aksnes et al., 2019; Stremersch et al., 2007), is indeed valued.

The positive association between participation in writing workshops and the likelihood of a work being chosen suggests that the skills honed in these workshops are recognized as valuable. Morss and Murray (2001) note that these workshops often aim to improve clarity, argumentation, and structure – all crucial elements of effective scholarly communication. If higher participation signifies greater engagement with these developmental activities, this finding reinforces the importance of investing in writing skills.

Finally, the positive, albeit smaller, impact of access to comprehensive software usage training highlights the growing importance of technological proficiency in the contemporary academic landscape (Green et al., 2005; Willis et al., 2010; Dixit & Sinha, 2022). While traditional academic writing literature might not always directly address software skills, the increasing integration of various tools in research, writing, and

dissemination suggests that the ability to effectively utilize these resources contributes positively to the perceived quality and presentation of scholarly works.

While the finding regarding grammar and spelling checkers software warrants further exploration, the positive associations with plagiarism checkers, citation software, writing workshops, and software training collectively paint a picture of evolving priorities in evaluating scholarly works. These priorities increasingly emphasize not only the content itself but also the integrity of the research process, the rigor of citation practices, and the effective utilisation of tools that contribute to the overall quality and presentation of academic output.

## **Conclusions and Recommendations**

The research reveals a strong enthusiasm among researchers, teachers, and students for integrating online technological tools into their Bangla scholarly writing. This positive outlook persists despite limited prior experience with specific software. The significant results underscore this sentiment and its potential.

The high willingness to adopt grammar and spell checkers tools directly aligns with the expressed enthusiasm for enhancing writing quality. The research suggests that respondents perceive these tools as crucial for improving the accuracy and professionalism of their Bangla scholarly work. Likewise, the strong interest in plagiarism checkers highlights a commitment to academic integrity and the production of original academic and research work. This aligns with the overall goal of boosting the perceived credibility and quality of scholarly work, as originality is a fundamental aspect of scholarly rigor. The eagerness to utilize citation managers directly supports the aim

of producing high-quality academic work. Proper citation and referencing are essential for academic credibility and avoiding plagiarism, further reinforcing the notion that these tools can significantly enhance the perceived quality of scholarly output. Workshops enhance capacity building in writing Bangla scholarly works is a pivotal result. This demonstrates a direct link between structured learning interventions and improved abilities in utilizing these tools. It reinforces the idea that even with limited prior experience, targeted training can effectively bridge knowledge gaps and empower users to leverage online technologies for better scholarly writing. Based on the estimated results, we recommend the following strategies to enhance Bangla scholarly writing.

- i. Invest in the development or adaptation of online grammar and spell checkers, plagiarism checkers, and citation managers specifically designed for the nuances of the Bangla language. This will directly address the expressed need and maximize the effectiveness of these tools for Bangla scholarly writing.
- ii. Implement and regularly conduct workshops on the effective use of online technological tools for Bangla scholarly writing across educational institutions in Bangladesh. These workshops should be practical, hands-on, and cover the functionalities of grammar/spell checkers, plagiarism checkers, and citation/referencing software.
- iii. Incorporate the use of online scholarly writing tools into the curriculum for relevant academic programs (e.g., research methodology, academic writing courses) from an early stage. This will normalize their use and build foundational skills among students.

- iv. Universities and research institutions should establish dedicated support centers or helpdesks to assist researchers, teachers, and students with technical issues and best practices related to online scholarly writing tools.
- v. Promote a broader culture of digital literacy within academic communities, emphasizing the benefits of technology for enhancing research productivity, quality, and ethical conduct.
- vi. Explore partnerships with software providers or institutional subscriptions to make advanced versions of grammar checkers, plagiarism detectors, and citation managers more accessible and affordable for the academic community in Bangladesh.

However, a major hurdle identified is the scarcity of robust online technological tools specifically designed for Bangla scholarly works. This lack of language-specific support poses a substantial challenge to upholding academic integrity and ensuring the quality of Bangla scholarly works meets ethical, scientific, and global standards. To address these issues, the study strongly recommends that academic institutions and technology developers collaborate to develop and promote Bangla-specific software, particularly for grammar and spelling checks, plagiarism detection, and citation management. Furthermore, educational and research institutions should implement comprehensive workshop programs. These programs should focus on effectively utilizing both existing and new online technologies for Bangla scholarly writing, while also promoting a strong culture of academic integrity through technology integration.

It is important to acknowledge that this study's findings are primarily based on data from the Pabna district, which may limit

their generalizability to other parts of Bangladesh or broader academic contexts. Additionally, the reliance on self-reported willingness to adopt software, rather than actual usage data, suggests a potential gap between stated intentions and real-world behavior that warrants further investigation.

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