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Students' Preference in Using Chatbots for Academic Writing

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Abstract

Objective: To study the feature preference(s) in Artificial Intelligence (AI) Chatbots among Post Graduate students in the Commerce and Management domain who have experienced Chatbots for academic writing. **Methods:** The authors used the combined AHP-TOPSIS method to approach the 214 student's responses studying in autonomous institutions under the University of Mysore, India. **Findings:** The results show that the students prefer tools that provide information from authentic sources, followed by tools that are easy to use. Open source and style of presentation are the other preferences. This study has identified the top nine Chatbots identified by the students, and the authors used the AHP (Analytic Hierarchy Process) - TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method to present the tools with a defined rank based on priority. **Novelty:** Authors observed during the literature review that there are research studies that record and discuss the experience of use of Chatbots. However, there needs to be more studies that analyse the user preferences in these AI tools focused on education. Considering the usage of these tools in academic writing, this study stands out and reports the gap in this area.

Keywords: Chatbots; Artificial Intelligence; Content Generative Tools; User Preference Study; AHPTOPSIS Model

1 Introduction

The teaching-learning process is undergoing a transformation introducing various methods of student-teacher interaction. Artificial Intelligence (AI) plays a significant role in designing course curricula & activities, submitting assignments & reports, and framing evaluation components. Digital natives are more towards using Generative AI tools for the content requirement for projects, assignments, and other evaluation components. The author(s), the faculty members, attempted to understand the digital natives' perception of - authenticity, ease of use, open access and presentation style in Generative AI tools or Chatbots. As described in the subsequent section, these factors are identified as gaps in the literature as traced by the authors. The authors have observed that these AI tools have enabled the students to move towards conversational and personalised learning approaches empowering them to get the content to meet their

needs. Further, these tools have created new opportunities for EdTech and Learning Platform segments in the industry and made them focus on student-centric services rather than teacher-centric services.

Chatbots use Natural Language Processing (NLP) technology to enable the interaction or conversation between a human and a machine or computer, filling the communication gap between men and machines [1]. The ability to emulate human conversations has made chatbots more familiar in the field, which demands the content and analysis of data & information; this includes the teaching-learning or education segment [2]. Further, they are known for the cost-effective personalized learning experience for students and researchers. Scalability is the third and most important feature [3]. It is flexible, adaptable and best for the online learning environment extending the instantaneous, seamless content of the course, assignments, evaluation components like quizzes, and study materials [4–6]. Above all, these chatbots interact individually with the user and accommodate them to learn from audio, video, graphics, short movies, presentation slides and other sources of information which make students with different learning styles choose what they want is extensively discussed in the research work by Chen et al., Lin et al., and Wu & Yu [7–9]. However, as said, authority also comes with responsibility, and benefits come with challenges; the benefits and challenges are extensively discussed by significant research works of Lin et al., and Abejide et al., [8,10].

The existing study focused on studying the preference preferences(s) of master's degree students in the Commerce and Management domain who have experienced Chatbots for academic writing. The authors used the AHP-TOPSIS method to approach the 214 student's responses studying in autonomous institutions under the University of Mysore, India. They circulated to the students of selected institutions offering Master of Business Administration and Master of Commerce in the Mysore region of India via email. Three institutes agreed to participate in this study. The email was sent to 800 respondents via email, and 214 respondents answered the questionnaire. The students were of the age group between 21 and 24 years from diverse cultural backgrounds. The sample included students from different undergraduate programs namely Bachelor of Business Administration (BBA) — 113; Bachelor of Commerce — 59; Bachelor of Engineering — 32; Others — 10. The student's representation was both from North and South India.

Since this study is focused on understanding the students' preferences in using AI Chatbots for class assignments and submissions, the authors attempted to study the different dimensions of approach by the students to use the Chatbots. According to the research [11], these tools greatly help the students to spark creative ideas on the given topic. Further, it encourages them to analyze the topic with different dimensions and approaches to understand it better. The ability of these tools to review, analyze and share feedback on the given content is to be appreciated. This instant feedback mechanism will significantly help the students to revisit their submission drafts. The conversation's ability to keep the user engaged in continuous interaction is the key feature many researchers have appreciated [12]. The authors have observed that researchers have pointed out the ability of these tools to summarize articles, notes, project works, etc., and to present annotated or concise summaries [13,14]. This will help the students get the gist of the key or core publication in the given topic. The presentation of the information from different sources and the style of organizing the content for meaningful understanding is appreciated in some of the core works referred to by the authors in this study [15].

Further, the authors opine that this will help the students improve the style of presentation, language, organizing of content for presentation, and overall, as independent learners. Irrespective of the focus of the study on the Chatbots or AI tools, authors have raised their concern about the awareness of the ethical use of AI tools in the teaching-learning process [15]. This calls for a structured information literacy program and AI policy implementation in the education setup.

2 Methodology

The study consists of two phases. The first phase consists of applying the Analytic hierarchy process (AHP) to determine the weights of the criteria selected for the study. The second stage involves applying the top method for assigning priority weight to students' AI tools for education.

2.1 Analytic Hierarchy Process (AHP)

AHP belongs to a class of multi criteria decision-making techniques, which is helpful in instituting priorities based on pairwise comparisons [16]. AHP is extensively used in cases where several criteria are considered for effective decision-making. The technique has been effectively used in several fields ranging from management, agriculture, industry, governance, and decisions involving strategic importance [17]. The study's primary goal is to understand the Students' Preference for Using Chatbots for Academic Writing. In this context, a hierarchical model is developed to determine the weights for each priority, consisting of goals and sub-criteria. The steps in the AHP process are described in the following steps [18].

1) Construct a matrix to compare attributes pairwise based on Saaty's scale (Table 1). The diagonal values in the pairwise comparison Matrix (PCM) are always 1, and the values in the lower left are inverted. If we consider A = The pairwise comparison

A = [aij]nxn can represent as aji=1aij/.

2) Compute the criteria weights by taking the Geometric Mean of the respective elements in each row as described below $\widetilde{aij} = aij/\sum_i aij$

$$Wi = \left(\prod_{j=1}^{n} aij\right)^{1/n} \quad (1)$$

3) Compute the Lambda max (λmax) value which should equal the number of factors in the comparison n for total consistency as follows:

$$\lambda max = \sum_{i=1}^{n} \left(\sum_{i=1}^{n} aij\right) Wj \quad (2)$$

4) Compute the Consistency Index (CI measures as follows:

$$CI = (\lambda Max - n)/n - 1 \quad (3)$$

5) Compute the Consistency Ratio (CR). If the CR is less than 0.10 (CR<0.1), then the ratio shows acceptable consistency in the AHP. If CR is more than 0.10 (CR>0.1), the ratio is inconsistent: The consistency ratio is computed as follows.

$$CR = CI/RI \quad (4)$$

The ratio should be less than 10 %. The random index (RI) is calculated based on the number of criteria selected for the comparison (Table 2).

Table 1. Ratings for using AHP

Pairwise comparison scale	Numerical Rating
Extremely preferred	9
Very strongly preferred	7
Strongly preferred	5
Moderately preferred	3
Equally preferred	1
Intermediate values	2,4,6,8

Table 2. Random Consistency Table

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

2.2 Topsis Approach

The topics approach, known as the technique for order preference by similarity to the ideal solution, was developed by Hwang and Yoon, 1981. The method is generally practiced in the manufacturing and operations area. However, the authors have come across the application TOPSIS in the studies focused on technology adoption, decision-making, service segment, and AI application as reported in the work of Abdullah et al., Alawiah & Putri; Stecyk & Miciuła; and Wang et al.[19–21]. It is based on the concept that the optimal solution or criteria should be chosen so that it is farthest from the anti-ideal solution and closest to the ideal solution. The approach is based on the fact that each criterion selected for the study should be inclining towards monotonically decreasing or increasing utility. The relative closeness of the selected alternatives to the ideal solution is assessed with the help of the Euclidean distance strategy. The TOPSIS method includes the following steps[22].

1. Compute the normalized ratings(rij by using the vector normalization procedure.
   r= Xij/ $\sum_{i=1}^{m} (xij)2$
2. Calculate the weighted normalized rating value by
   Vij = Wj×rij
   Where i= 1, 2,…m; j-1,2…..n.
3. Identify the positive ideal solution(PIS , A* and negative ideal solution (NIS), A- for each criterion.

Here A*= (v1*,v2*,…….vn*) and vj* is the best possible value of the jth criterion with respect to all the other available alternatives.

A-= (v1,v2,……,vn) and vj- is the worst possible value of the jth criterion with respect to all other available alternatives.

4. Compute the separation of each alternative from the ideal solution and anti-ideal solution.

$Si^{+} = \sqrt{(\sum_{j=1}^{n} (vij - vj*)}$^2)

Si-=$\sqrt{\sum_{j=1}^{n} (vij - vj-)}$^2)

5. Compute the similarity rating or similarity score from the ideal solution (relative closeness to the ideal solution) by $Ci = \frac{Si-}{Si++Si-}$.

6. Rank the preference order according to the value of Ci.

3 Results and Discussion

The weights of each criterion were determined by the AHP method. The authors designed the questionnaire for the study based on Saaty's nine-point scale. They circulated to the students of selected institutions by email. The email was sent to 800 respondents via email, and 214 respondents answered the questionnaire. The results are presented in Table 3.

Table 3. Determination of weights of criteria

Sl. No	Criteria	Weights	Rank
1	Authenticity	0.35	1
2	Easy to use	0.25	2
3	Open source	0.21	3
4	Style of Presentation	0.19	4

The same set of 214 students was contacted for categorizing the AI tools, and the geometric mean of the judgments based on the Likert scale of 1 to 5 (1 strongly disagree to 5 strongly disagree) was recorded (Table 4). The Google Form link is shared to the email and through the WhatsApp group to reach the identified sample.

Table 4. Assignment of Scores to attributes

Weights	0.35	0.25	0.21	0.19
AI Tools	**Authenticity**	**Easy to use**	**Open source**	**Style of Presentation**
ChatGPT	3	4	4	3
Google bard	3	3	4	3
Microsoft Bing	4	4	4	4
Perplexity AI	3	5	5	4
Cohere Generate	3	2	3	3
Copy.ai	4	4	3	4
Rephrase.ai	4	4	3	3
Murf.ai	4	4	2	4
ChatFlash	3	5	2	4

The weighted normalized matrix, the calculation of the ideal best and ideal worst, and the computation of relative closeness to the ideal solution are presented in Tables 5, 6 and 7.

The TOPSIS technique method highlights that Perplexity AI has the highest score, the most preferred AI tool among the students. Microsoft Bing occupies the second position based on the students' responses, followed by CHATGPT and the others.

This AHP study reveals in Table 3 that students are very concerned about the 'Authenticity' of the information resource and source of the information from which the Chatbots present the information or content. The authors appreciate the concern and interest of the students to have information from authentic and scholarly publications. This tops their priority segment with an average weight of 0.35 out of 1. The second priority is the 'Easy to Use' with a weight of 0.25. This is obvious as they prefer tools that are easy to interact with, navigate and interoperable for porting or transferring information. 'Open Source' stands in third place with a score of 0.21 in this study. Students prefer to have the chatbot, which is on an Open Platform, and as beginners in this exploration of AI tools, they are not ready to avail of the licenses or subscriptions; they prefer their test bed on any Free or Open tool. 'Style of Presentation' is the fourth priority of the students, with a score of 0.19. The style or the output

Table 5. Weighted normalized matrix

Weights	0.35	0.25	0.21	0.19
AI Tools	**Authenticity**	**Easy to use**	**Open source**	**Style of Presentation**
ChatGPT	0.101	0.084	0.081	0.053
Google bard	0.101	0.063	0.081	0.053
Microsoft Bing	0.134	0.084	0.081	0.071
Perplexity AI	0.101	0.105	0.101	0.071
Cohere Generate	0.101	0.042	0.061	0.053
Copy.ai	0.134	0.084	0.061	0.071
Rephrase.ai	0.134	0.084	0.061	0.053
Murf.ai	0.134	0.084	0.040	0.071
ChatFlash	0.101	0.105	0.040	0.071

Table 6. Computation of Ideal best and ideal worst

AI Tools	**Authenticity**	**Easy to use**	**Open source**	**Style of Presentation**	**Si+**	**Si-**
ChatGPT	0.101	0.084	0.081	0.053	0.048	0.058
Google bard	0.101	0.063	0.081	0.053	0.060	0.046
Microsoft Bing	0.134	0.084	0.081	0.071	0.029	0.069
Perplexity AI	0.101	0.105	0.101	0.071	0.034	0.089
Cohere Generate	0.101	0.042	0.061	0.053	0.084	0.020
Copy.ai	0.134	0.084	0.061	0.071	0.046	0.060
Rephrase.ai	0.134	0.084	0.061	0.053	0.049	0.057
Murf.ai	0.134	0.084	0.040	0.071	0.064	0.056
ChatFlash	0.101	0.105	0.040	0.071	0.069	0.065
Ideal best Vj*	0.134	0.105	0.101	0.071		
Ideal worst Vj-	0.101	0.042	0.040	0.053		

Table 7. Computation of relative closeness to an ideal solution

AI Tools	**Si+**	**Si-**	**S++Si-**	**Ci=Si-/(Si++Si-)**	**Ranks**
ChatGPT	0.048	0.058	0.106	0.549	4
Google bard	0.060	0.046	0.105	0.432	8
Microsoft Bing	0.029	0.069	0.098	0.705	2
Perplexity AI	0.034	0.089	0.123	0.726	1
Cohere Generate	0.084	0.020	0.104	0.195	9
Copy.ai	0.046	0.060	0.105	0.568	3
Rephrase.ai	0.049	0.057	0.106	0.540	5
Murf.ai	0.064	0.056	0.121	0.468	7
ChatFlash	0.069	0.065	0.134	0.485	6

format certainly matters as it will help with reading, organizing, synthesizing and representing the information based on the understanding of the content.

Table 6 of the study presents the Ideal Best and Ideal Worst scores based on the TOPSIS methodology analyzed by the assignment of scores to attributes — authenticity, ease to use, open source and style of presentation — as presented in Table 4 and the normalized weight matrix presented in Table 5. Generally, in such studies, criteria can be classified as Benefits and Non-Benefit. In the case of higher values, preferred Benefit Criteria are considered, and lower values are considered in the case of Non-Benefit Criteria. For example, if we select a mobile or cell phone based on the features — Cost, Memory and Camera Pixels — the cost value will always be considered the lowest, and for the other 2 — Memory and Camera Pixels — it will always be considered the highest. Therefore, cost belongs to the Non-Benefit Criteria, and the other two features belong to the Benefit

Criteria. In the present study, since all the criteria related to the selection of AI Chatbot tools, all the features are the Benefit Criteria. This study shows that the Ideal Best Computation is — Authenticity — 0.134, Easy to Use — 0.105, Open Source — 0.101 and Style of Presentation — 0.071 — for the AI Chatbot tool for the PG Students of Commerce and Management. Further, the Ideal Worst Computation is — Authenticity — 0.101, Easy to Use — 0.042, Open Source — 0.040 and Presentation Style — 0.053.

Table 7 of the study, which presents the computation of values of the identified AI chatbots, shows that Perplexity.ai has the highest score of 0.726, which indicates the Ideal Best among the other tools. The authors opine that this is because the indication of information sources and providing links to access the same has made the students choose this tool. Furthermore, the availability of tools on Open Access and the best interactive feature has helped it to top the list. Microsoft Bing (0.705) is a close contender for the top position with its brand name, collaboration for information resource sharing by premier information aggregators, style of presentation, and the leads to the information sources have greatly helped Bing to secure second place. The third and fourth place is occupied by copy.ai (0.568) and ChatGPT (0.549) with close values. This is obvious as both these tools are very good at providing content by needing more authenticity and style of presentation. Furthermore, ChatGPT is pushed to fourth place due to the release of a commercial version with more features and the availability of data only till November 2022 in the Open Access version has made the users look for better and open-source tools. The next close contenders in the ranking are Rephrase.ai, with a score of 0.540 in the fifty places. As Rephrase.ai is primarily known for paraphrasing or rephrasing content, this tool should present beyond its core feature and grow to be an authentic content provider to the users. In the sixth, seventh and eighth places, we have ChatFlash (0.485), Murf.ai (0.468) and Google Bard (0.432). Cohere Generate is in ninth place with a score of 0.195.

The study is unique since it adopts the combined AHP-TOPSIS method for prioritising the students' perceptions in using an AI Chatbot for learning. The AHP tool aids in giving appropriate weights to the factors: authenticity, ease to use, open access, and presentation style. Further, these weights serve as an input for the TOPSIS method applied for categorising the various AI tools students use. The combined AHP-TOPSIS method provides insights to the teaching community on suggesting suitable AI tools in the academic curriculum. Further, it helps them design the information literacy program on the use of AI tools and AI policy to embed with the program's existing academic norms and procedures.

Since this study is focused on the perception of Postgraduate students in the area of Commerce and Management, it aligns with the recent research from [23–25], which supports the researcher's claim of imbibing AI tools in the teaching-learning process. This study reveals that students give higher weightage to the authenticity factor while using an AI tool. Since the present academic is research-driven and demands the accuracy of information sources, it is essential to overcome plagiarism and IPR issues. Most of the students in this domain are from non-technical backgrounds, and this demands self-navigating and menu-driven tools. This has made the respondents place ease of use in the second priority segment. It is observed that AI tools in the Open Access domain perform equally to those of the Commercial or proprietary counterparts. This has made the students experiment with the freely available Open tools without any financial implications. Further, this has educated them in using AI tools and the due diligence or care to be taken in borrowing the content for the study and research. This has given the students Open Access to be considered in third place. From this study, the presentation style has been given the least weight, contrary to the industry's requirement. It can be inferred now that students feel that accuracy and ease of use are most important in selecting or choosing AI tools.

There are many drawbacks to using AI tools in research and learning. Its use can have an adverse impact on the creativity and critical thinking of students and researchers [26]. Farrokhnia et al., [27] in their research work opined that the key drawback of ChatGPT or any other Generative AI tool is their inability to share feedback about the organization of the content and the proper referencing to the information source, which is very critical in the academic writing. The researchers point out that the judicious use of generative AI tools like ChatGPT should be practiced taking into consideration ethical, legal, and social issues [28]. This demands the formation of a proper framework to develop a policy for the usage of AI tools.

4 Conclusion

This study focused on analyzing the students' perception of adopting AI tools in a commerce and management institute. The results indicate that authenticity (0.35) and ease to use (0.25) are the top factors the respondents consider. This supports the institute's requirement to provide authentic and published content for study and research for the student community. Further, the students also are aware of the impact of plagiarism, unethical practices, and copyright issues in an academic environment. Hence focus is more on the authenticity of the information sources. This is also evident with the availability of AI content similarity check in Turnitin – the tool used by the institute to check the level of plagiarized content; the student is more conscious about the authenticity of information and gives proper references for borrowing the content. As described in the earlier section, this domain attracts more students from the non-technical domain. Hence ease of use is the second preference.

It is different from what the teachers or the organization feel towards the AI Chatbot in specific or any technology tool in general; the fact is that our students need to understand, use, and manage technology to drive business in the contemporary world. The combined multi-criteria decision-making technique AHP and TOPSIS is effective in drawing conclusions with respect to the adoption of AI tools. This study highlights that the most preferred AI tool among the students is perpelexity.ai, contrary to the general assumption that ChatGPT is the most popular AI tool used in the academic environment. Microsoft Bing and Copy.ai were the second and third choices, respectively. ChatGPT and Rephrase.ai are in fourth and fifty places.

Research has shown that leaders who embrace a digital mindset can better set up their organizations for success and build a resilient work environment. At one end, corporate demands for digital skills and the supply of talent, and institutions are trying to ban & restrict the use of the upcoming technologies. Technology will continue to evolve, and it is continuous that institutions should understand the preferences of young managers and have an information literacy program to use the same with due diligence with an ethical mindset. This demands the proper information literacy program and well-structured AI Policies in place. The institutions should move with the future technologies — AI, metaverse and analytical tools — to continue transforming the corporate world.

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