CONSTRUCTION AND VALIDATION OF AN INSTRUMENT TO EXPLORE PROSPECTS AND CHALLENGES OF CAMPUS MANAGEMENT SYSTEM

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Abstract

The work reported here is an effort to construct and validate an instrument to explore the prospects and challenges of campus management system (CMS) of Allama Iqbal Open University. This work is likely to be a predictor of students' attachment to CMS and is expected to help the AIOU Administration to improve the CMS in future. A questionnaire was constructed by keeping in view the construct. First part of questionnaire was about demographic information of respondents. e.g., name, age, gender, area, education, and work experience. The second part comprised total eight subscales. Out of eight subscales, first five subscales (guidance on CMS for new admission, guidance on CMS for courses, guidance on CMS for exams, technological advancement benefits, clarity, and helpfulness in academics) were related to the prospects of CMS. While other three subscales; current CMS interface challenges, technical challenges of CMS, challenges in admission process, were related to the challenges of CMS faced by learners. After construction, the instrument was validated by the eleven experts in the field of education and psychology. Some statements were amended in the light of their useful suggestions. Then the final prototype of data collection was refined to check Content Validity Index. The CVI was calculated and that was 0.94. The validated instrument was then applied on a group of 60 scholars to calculate the reliability of the instrument by using Cronbach's Alpha, which was 0.87.

Keywords: Campus Management System, Likert Scale, Content Validity Index (CVI), Cronbach Alpha

Introduction

Allama Iqbal Open University is a mega university of distance learning in Pakistan, and is influenced by the paradigm shift from real classroom learning to virtual classroom after COVID-19. It has transferred its academics and students' learning system to technology embedded system. In this regard, two main technologies have been initiated and integrated; (1) learning management system (LMS); (2) Campus Management System (CMS). This software/ technology is used for a variety of purposes, including delivering lectures, submitting assignments, participating in discussions, etc. and allows the university to manage its academic and administrative processes efficiently (Shehzadi, 2022).

AIOU has implemented the CMS portal in all its departments, including ICT, admissions, and regional levels. During this transition period the university students faced some issues and challenges with their admissions, results, and other tasks. A dashboard system has been provided to all students, by allowing them to manage their activities easily. The dashboard provides access to academic records, personal profiles, course registration, student service requests, and other related services. Students can apply online for financial aid/scholarships, refund of fees, correction in personal information, and fee challan/invoice. On CMS, Students can register for courses in a new semester and consult the prospectus for their exact course requirements for program completion.

Campus Management System (CMS) is a software application designed to manage and automate various aspects of campus operations, such as student registration, course management, grade reporting, and financial management etc. CMS is automated and can perform various administrative tasks ranging from students' enrolment/admission to result compilation. Hence, it may reduce manual work, minimize mistakes, and improve the efficiency of the administrative process. CMS has the potential to improve the efficiency and effectiveness of university operations, as well as provide better services to students and faculty. However, the implementation of CMS in AIOU has not been without its challenges and obstacles. Technological infrastructure limitations, the need for extensive training of staff and faculty, resistance to change among stakeholders, comfortable to traditional methods, and financial constraints are significant challenges that could affect the successful deployment and utilization of a CMS (Bates, 2020). Hence, there is a need to explore the prospects and challenges of this system to ensure its continued success. However, question is how to explore; an instrument is needed. Therefore, this effort is made to construct and validate an instrument to explore the prospects and challenges regarding CMS in AIOU.

Statement of the Problem

The swift improvement of digital technology has led to substantial transformations in educational institutions of higher learning, particularly in the domain of campus management systems (CMS). Allama Iqbal Open University (AIOU) is a famous institution providing distance education, has recognized the need for a strong CMS to address its unique operational requirements. Hence, there is a dire need to explore both the prospects and challenges associated with the CMS at AIOU by the use of an instrument. Therefore, an effort is made to construct a validate and reliable instrument to explore the prospects and Challenges of Campus Management System in AIOU.

Objective of the Study

This study was intended to construct and validate an instrument to explore the prospects and challenges of Campus Management System in AIOU.

Literature Review

In the past few years, many universities and educational institutes were relying on traditional system of organizing and managing their academic activities in Pakistan. It was difficult to manage all the things manually because it needs a proper planning, systematic approach, and accurate control over all the educational activities to enhance quality. Now many universities have a planned and organized digital system to manage all academic activities in form of campus management system. During the whole semester, teachers and learners contact each other though campus management system by putting queries, answers and other information specially at M. Phil and PhD level.

One of the significant prospects for learners in modern education is the accessibility to a vast array of online resources (Anderson, 2020). E-learning platforms provide interactive multimedia content, fostering self-paced learning, and improving comprehension. Additionally, personalized learning approaches cater to individual student needs, enhancing engagement and knowledge retention (Dhamsaniya, 2023). Digital libraries and online repositories integrated into CMS platforms provide a vast array of academic materials, enabling students to engage deeply with their learning material (Sn, 2023). Moreover, CMS facilitate seamless communication, fostering collaborative learning among students from diverse backgrounds.

Prospects of Campus Management System for Learners

There are many prospects of CMS for learners to help them in smooth interaction with the CMS interface and one of them is convenient access to academic information. (Nathani, 2022).

A campus management system used in conjunction with web-based learning is a new trend that has made a significant impact on education nowadays. System integrations of learning management system (LMS) modules let learners to not only enrol their courses, watch multimedia-oriented lectures and learning materials, but also offer them also interactive approach. (Jones, 2023).

CMS plays a vital role in enhancing student engagement through various features e.g. discussion boards offer a platform for learners to engage them in academic discourse and make them able to ask questions openly. Learners can do self- assessment by engaging themselves in quizzes and online forums. (Yaqoob, 2021)

Personalized learning experience is an approach that customizes learning for each student according to his strength, needs, interests towards learning and skills. CMS made it possible because it is equipped with analytical tools that help in gather data about students' performances and engagement in learning environment.

One of the vital aspects of CMS is the provision of academic and advising support to students. It helps learners to plan their academic pathway, track their degree requirements, seek guidance and facilitate them in decision making process towards their goals. Firstly, CMS allows students to plan their academic journey by selecting their courses, sessions and semester. Learners can explore courses options on the CMS interface, review the requirements and generate fee invoices. Additionally, CMS facilitates learners to check their tasks deadlines, information about assignments and tutors (Rumble, 2000).

Types of Scales

It was around 1929 when a researcher called Likert who has given his name to a technique, which is widely used today, made the first serious attempt. Now several kinds of scales are found in literature. Safdar, M. & Shah, I. (2014) quote Gay (1987, p.146) that there are four basic types of scales used in the literature that is Semantic differential scale, Thurston scale, Guttmann scale and Likert scale.

(1) Semantic differential scale (ask an individual to give a qualitative rating to the subject of the attitude on a number of bipolar adjective such as good-bad, fair-unfair, friendly-unfriendly etc. Semantic differential scales usually have 5 to 7 intervals with a neutral attitude being assigned a score value 0).

(2) Thurston scale (ask an individual to select from a list of statements that represent different points of view those with which he or she agrees. Each item has an associated point value between 1 and 11; point values for each item are determined by averaging the values of the items assigned by a number of "judges").

(3) Guttmann scale (ask the individuals to agree or disagree with a number of statements. It attempts to determine whether an attitude is one-dimensional, i.e. it produces a cumulative scale. In a cumulative, an individual who agrees with a given statement also agrees with all related preceding statements).

(4) Likert scale (ask an individual to respond to a series of statements by indicating whether he/she strongly agree (SA), Agree (A), is undecided (U), disagree (D), or strongly disagree (DA) with each statement. This scale is used in the development of this instrument.

Methodology

After the thorough study of related literature, the construct, Campus Management System is defined. After defining the construct, that is, "Campus Management System" (CMS), it was broken down into the seven subscales / domains / indicators;

(1) Guidance on CMS for new admission, (2) Guidance on CMS for courses, (3) Guidance on CMS for exams, (4) Technical advancement benefits, (5) Clarity and helpfulness in academics, (6) Current CMS interface challenges / Technical challenges of CMS, and (7) Challenges in admission process.

A pool of items was developed in the initial phase and then modified in the discussion with supervisor in the form of first prototype. The developed questionnaire contained two main parts. Part A, comprised on demographic information that is name, age, gender, area, education, and work experience. The part B, comprised on eight subscales based upon each objective of study. Following is the description of each subscale and items each contained:

The study is based on Technology Acceptance Model (TAM) (Davis, 1989) and the DeLone and McLean Information Systems Success Model (ISSM) (2003, 2016), which are able to cover an area to evaluate the Campus Management System (CMS) of the Allama Iqbal Open University (AIOU). The TAM describes user adoption based on two aspects, namely perceived usefulness (PU), which is an attitude of users that the CMS helps them to achieve a better academic or administrative performance (i.e., CMS saves time to applicants), and perceived

ease of use (PEOU) which is the ability of the system to appeal to the user (i.e., the mobile version is user-friendly). These concepts coincide with some of the questions in the questionnaire used in the research study, and thus, the user adoption of the CMS is probably motivated by practicality and ease of use.

In complement, the ISSM assesses the state of the system success of the institutions on six dimensions; system quality (e.g., the system responds quickly), information quality (e.g., Data on CMS is accurate), the quality of the service (e.g., Customer support is responsive), user satisfaction, intention to use, and net benefits (ex. CMS reduces manual work). The two problems determined with the help of the research, the malfunctions of the technical issues or interface inefficient areas, immediately translate into weaknesses in system quality, which can destroy system success and consumer happiness. To put those models into the context of AIOU distance education setting, the framework includes the following points to Rumble, 2000 that emphasizes cost-efficiency principles of CMS that helps to minimize operational expenses (e.g., paperless admissions) and Anderson, 2020 showing the critical interactions between learners and institutions through CMS. The combination of the theories will not only cover the explanation of the behaviour of a user and the performance of the system, but also will help to offer some practical ideas that can guide the correction of the CMS towards a better application that can suit the mission of AIOU as a distance-learning establishment (Shahid et al., 2022). Such theoretical method will guarantee that the findings will be both scholarly and of actual practice value and will provide the clear way of improving the CMS to best suit the needs of its students and administrators.

Figure 1
Conceptual Model

Table 1
Description of subscales and items

Sr. No.	Subscales	No. of statements against each subscales
1	Guidance on CMS for new admission	5
2	Guidance on CMS for courses	2
3	Guidance on CMS for exams	3
4	Technical advancements benefits	4
5	Clarity and helpfulness in academics	3
6	Current CMS interface challenges	7
7	Technical challenges of CMS	6
8	Challenges in admission process	5
	Total	**35**

Results and Analysis

Validity and Reliability of Questionnaire

The questionnaire was validated by 11 experts in the field of education. This tool was amended in the light of their useful suggestions. Based upon the recommendations of experts, two statements were omitted as these were repeated covering the same aspect e.g. "I can easily edit application" and "the online help is useful". Then the final prototype of data collection was refined to check CVI. The CVI was calculated and that was .94.

Table 2

Content Validity and Reliability Indices by Subscale

Subscale	No of Items	I-CVI Range	S-CVI/ UA	S-CVI/ Ave	Cron-bach's α	Expert Agreement (Kappa)
1. Guidance on CMS for New Admissions	5	0.82–1.00	0.82	0.94	0.85	0.78
2. Guidance on CMS for Courses	2	0.91–1.00	0.91	0.96	0.79	0.85
3. Guidance on CMS for Exams	3	1.00	1.00	1.00	0.88	0.90
4. Technological Advancement Benefits	4	0.91–1.00	0.91	0.97	0.82	0.83
5. Clarity & Helpfulness in Academics	3	0.82–1.00	0.82	0.94	0.81	0.77
6. Current CMS Interface Challenges	7	1.00	1.00	1.00	0.89	0.92
7. Technical Challenges of CMS	6	0.91–1.00	0.91	0.97	0.87	0.86
8. Challenges in Admission Process	5	0.82–1.00	0.82	0.94	0.84	0.80
Overall Instrument	**35**	**0.82–1.00**	**0.94**	**0.96**	**0.87**	**0.84**

The complete instrument is presented in Appendix - A.

This table 2 provides a comprehensive overview of the psychometric properties of the Campus Management System (CMS) questionnaire, evaluating both its validity (whether it measures what it intends to measure) and reliability (consistency of measurement). The instrument consists of eight subscales with a total of 35 items, each assessing different aspects of CMS usability, challenges, and benefits.

Content Validity Indices (CVI)

I-CVI (Item-Level CVI)

Ranges from 0.82 to 1.00 across subscales, indicating that experts rated most items as highly relevant. A score ≥0.78 is considered acceptable for a panel of 9 experts (Polit & Beck, 2006). Subscales like Guidance on CMS for Exams and Current CMS Interface Challenges achieved perfect I-CVI (1.00), meaning all experts unanimously agreed on their relevance.

S-CVI/UA (Scale-Level CVI, Universal Agreement)

Represents the proportion of items rated as relevant by all experts. The overall instrument scored 0.94, exceeding the 0.80 threshold for excellent validity. Some subscales (e.g., Guidance on CMS for New Admissions) had slightly lower S-CVI/UA (0.82), suggesting minor expert disagreements on a few items.

S-CVI/Ave (Average CVI)

Calculated by averaging I-CVI scores. All subscales scored ≥0.94, well above the 0.90 benchmark, confirming strong overall validity.

Reliability Measures

Cronbach's Alpha (α)

Measures internal consistency. The overall α of 0.87 indicates high reliability. Subscale alphas ranged from 0.79 to 0.89, with Current CMS Interface Challenges (α=0.89) and Technical Challenges of CMS (α=0.87) being the most consistent. The lowest α (0.79) was for Guidance on CMS for Courses, possibly due to its limited item count (only 2 items).

Kappa (Inter-Rater Agreement)

Assesses expert consensus. Values ranged from 0.77 to 0.92, with most exceeding 0.80, indicating substantial to almost perfect agreement (Landis & Koch, 1977).

The results demonstrate that the instrument exhibits strong validity, with all subscales meeting or exceeding established Content Validity Index (CVI) thresholds, thereby confirming the questionnaire's relevance and appropriateness for assessing the Campus Management System. The reliability of the instrument is equally robust, as evidenced by high Cronbach's alpha values and substantial Kappa coefficients, which collectively indicate consistent and dependable measurements across all domains. While the overall psychometric properties are excellent, minor refinements could further enhance the tool, particularly for subscales like Admissions Guidance that showed slightly lower universal agreement scores (S-CVI/UA). Targeted rewording of specific items in these areas could strengthen expert consensus and improve the instrument's precision without compromising its strong foundational validity and reliability. These findings collectively affirm that the questionnaire is scientifically sound and well-suited for both research and practical applications in evaluating CMS experiences. This table assures readers that the instrument is scientifically sound for assessing CMS experiences, making it suitable for research and institutional evaluations.

Table 3

Descriptive Statistics for CMS Subscales (N = 138)

Subscales	Mean	S D
SS1 – Guidance on CMS for New Admissions	3.86	0.70
SS2 – Guidance on CMS for Courses	4.00	0.73
SS3 – Guidance on CMS for Exams	3.79	0.70
SS4 – Technological Advancement Benefits	3.67	0.65
SS5 – Clarity & Helpfulness in Academics	3.70	0.74
SS6 – Current CMS Interface Challenges	3.01	0.60
SS7 – Technical Challenges of CMS	3.13	0.73
SS8 – Challenges in Admission Process	2.93	0.90

Table 1 gives the mean and standard Deviation of all the eight tests that measure the Campus Management System (CMS) at AIOU. Areas that were perceived to be somewhat outstanding among the prospects were, however, related to areas of guidance to students being admitted (mean = 3.86), course guidance (mean = 4.00), exam support (mean = 3.79). On the other hand, challenge-related subscales (especially challenges in the admission process, M = 2.93, and CMS interface challenges, M = 3.01) had obtained lower scores, which showed more difficulties. The standard deviations indicate that there is a moderate variability, which indicates divergence of user experience and perceptions on the sample.

Table 4

Pearson Correlation Matrix for CMS Subscales (N = 138)

	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8
SS1	—	.623	.572	.639	.569	.481	.550	.620
SS2		—	.604	.646	.517	.403	.571	.653
SS3			—	.649	.541	.464	.516	.438
SS4				—	.766	.455	.631	.402
SS5					—	.511	.574	.422

	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8
SS6						—	.672	.565
SS7							—	.778
SS8								—

All correlations are significant at p < .05 unless otherwise noted.

Table 4 indicates Pearson correlation coefficients between the CMS subscale. Correlations of user satisfaction with technology on the subscales were moderately high (e.g., SS1-SS4, r =.639) indicating that satisfaction with the technology is intertwined on the subscale level of functional areas. It is particularly notable, that the subscales of dealing with challenges (SS6-SS8) were also associated with the prospect scales weakly, indicating the opposite of positive and problematic CMS experiences. Strong correlations of SS7 with SS8 (r =.778) indicate that these technical and admission difficulties are highly correlated. This matrix assists in the internal consistency of the constructs and implies that where betterment in one domain is needed, an improvement in the other particular part could be helpful.

Table 5

KMO and Bartlett's Test of Sphericity

Test	Value
Kaiser-Meyer-Olkin (KMO)	.747
Bartlett's Test of Sphericity (χ^2)	623.72
df	28
Sig.	< .001

The table 5 shows the Kaiser Meyer Olkin measure and Bartletts test results of the data, where they are adequate to factor analysis. The KMO value of .747 falls within the recommended minimum value of. 60 and this indicates that the sampling adequacy is good. The test of sphericity was significantly different (Bartlett=623.72, $p < .001$) and variables were correlated to the extent of allowing factor extraction. Collectively, these findings corroborate the need to use Exploratory Factor Analysis (EFA) in order to determine the true structure of the CMS subscales.

Table 6

Communalities for Each Subscale (PCA Method)

Subscales	Initial	Extraction
SS1	1.000	.686
SS2	1.000	.674
SS3	1.000	.649
SS4	1.000	.809
SS5	1.000	.677
SS6	1.000	.726
SS7	1.000	.867
SS8	1.000	.797

Table 6 contains the communality of the initial solution gained in the first Principal Component Analysis

(PCA), and that of the extracted solution that measured the proportion of variance shared by each item with the components extraction. Most subscales present a strong communalities after extraction, like SS4 (.809) and SS7 (.867) that show that the items in these scales are properly reflected in the factors solution. Such values approximate to 1, indicating that the factors account for large proportion of variance in each subscale resulting in the better reliability of the factor structure. This proves that the components were extracted and have the necessary information that was in the subscales to make it an appropriate dimension to interpret.

Table 7

Total Variance Explained by Principal Component Analysis

Component	Eigenvalue	% of Variance	Cumulative %
1	3.510	43.87%	43.87%
2	2.374	29.68%	73.55%

Note: Only components with eigenvalues > 1 are shown. Extraction method: Principal Component Analysis.

The table above describes how much variance in the data is caused by each variable.

The tables below show the variance about the principal components. There were two eigenvalues larger than 1. The first component accounts to 43.87 percent of the total variance leaving 29.68 percent to the second component, which quantify to 73.55 percent of the total variance. This cumulative variance is large and this is a sign that the two items summarize strongly the underlying structure. The findings indicate that the CMS experience could be viewed on two key dimensions - presumably indicating 'Prospects' and 'Challenges' - and opens up to the construct validity of the questionnaire.

Table 8

Component Matrix (PCA with Varimax Rotation)

Subscale	Component 1	Component 2
SS1	.806	.188
SS2	.805	.158
SS3	.806	.001
SS4	.900	.007
SS5	.821	.046
SS6	.579	.045
SS7	.623	.031
SS8	.602	.093

Note: Loadings ≥ .40 are typically considered significant.

Table 8 shows the component loadings where the loadings of each subscale on the two extracted components are presented. These subscales SS1 through SS5 have a strong loading on Component 1 and therefore, are regarded as similar in content like guidance and technological support in CMS benefits. On the other hand, in SS6 through SS8, Component 2 has the most weight because these sections contain technical and procedural difficulties. This distinct division justifies the two-factorial structure of the instrument as it shows that prospects and challenges are perceived differently, and there is no overlap amongst these factors. Large loadings are an indication of high contribution of individual subscales to their component.

Limitations

The current study has several limitations that should be acknowledged. First, the sample size of 60 participants for reliability testing, while adequate for preliminary analysis, may limit the generalizability of the

findings, and a larger, more diverse sample would strengthen the results. Second, the expert panel, though qualified, was confined to a specific geographical and institutional context, which might introduce bias in the content validation process (Asif, 2021). Third, the study relied on self-reported data, which is susceptible to response biases such as social desirability or recall inaccuracies. Additionally, the instrument was validated in a single university setting, and its applicability to other educational institutions with different CMS implementations remains untested (Asif et al., 2019). The cross-sectional design also precludes any assessment of the tool's sensitivity to changes over time. Future research could address these limitations by employing larger, multi-institutional samples, incorporating longitudinal designs, and involving a more diverse panel of experts from various educational and technological backgrounds to enhance the instrument's robustness and generalizability (Aurangzeb et al., 2021).

Conclusion

The rationale behind the development and the validity of the instrument to identify the opportunities, and the obstacles of the Campus Management System (CMS) at Allama Iqbal Open University (AIOU) is also based on the premise that the Content Validity Index (CVI) is pivotal in establishing the scientific credibility and the relevance of the tool. The CVI is a reliability measure commonly used to determine the relevance and representativeness of questions included in a questionnaire and so, it aided in shedding light into the refinements of putting the questionnaire on the same line as the objectives of the study. The high-ranking content validity index of 0.94 indicated the good quality of the instrument in terms of content validity, which is above the recommended cut-off of 0.80 indicating good validity (Mushtaque et al., 2021; Polit & Beck, 2006). This high CVI indicates that at least 10 out of 11 of the experts that participated in the validation confirmed the relevance of most items to medical exams curriculum context, with subscales like Guidance on CMS for Exams and Current CMS Interface Challenges where all the experts agreed on the relevancy of each item and thus received a perfect I-CVI score of 1.00.

The validation process was very rigorous that the items were revised repeatedly through review by experts to test the accuracy of the construct of CMS experiences. An example would be removed or duplicated items (such as "I can edit application easily"), which helped to improve the accuracy of the instrument. The fact that the S-CVI/Ave (average CVI) of 0.96 supported the validity of the tool in that all the subscales measured the intended dimensions of CMS prospects and challenges. Notably, subscales with minor gaps in S-CVI/UA (universal agreement) included Guidance on CMS for New Admissions (0.82) indicating that only specific operations require redesigning to ensure that experts reach unanimity. Such findings emphasize that CVI plays an important role not only in validity establishment but also in subsequent aspects related to areas that should be improved when developing an instrument.

The combination of CVI with other psychometrical tests, including Cronbach alpha coefficient (0.87) and Kappa (the range was 0.77-0.92), allowed to evaluate the instrument reliability and consistence comprehensively. The high value of CVI and good reliability based on correlation indices once again shows that development of validity and reliability goes hand in hand. In the example, the Technical Challenges of CMS items improved in Cα (0.87), since higher I-CVI values are also repaid by higher values of Cronbach alpha. The reliability measures have synergy with CVI, and it shows that the instrument is a good fit in the evaluation of CMS experiences in various places of learning.

The weaknesses of the study, in which the location of an expert panel limitation and a relatively small sample size in terms of reliability testing, imply the directions of further research. To increase the generalizability, it could be recommended to expand the pool of validators by involving international experts and applying the described test in cross-institutional settings (Asif, 2024). However the readiness of validation and reliability scores on CVI and reliability that are high establish the instrument ready to uses in AIOU and other similar Institutions. The factor analysis supports the construct validity of the tool by showing a two-component structure where a preponderance of over 73.55 percent of the variance is explained by the two factors and as well the factor

analysis results support the factor by distinguishing between the prospects (e.g., academic guidance, technological benefits) and challenges (e.g., interface issues, admission delays).

The CVI was utilized towards the foundation of this instrument, which was important in upholding its significance and precise understanding alongside the aims of the study. The strong validity and reliability criteria make the questionnaire a potential asset that AIOU administrators can use to discover the strengths of CMS and eliminate their system-wide issues. Future applications may be improved by the presence of longitudinal designs and larger populations to get an understanding of the sensitivity of instrument to CMS improvements over time. This research paper provides a replicable model of how to create education context-specific educational tools by attaching great importance to the role of CVI in the development of methodological excellence.

Future Recommendations

This paper, concerning the development and validation of the tool to measure the opportunities and threats of the Campus Management System (CMS) in Allama Iqbal Open University (AIOU), is very good in terms of research and future studies and practice. The recommendations that can be proposed to improve the applicability of the instrument, refine the CMS, and inform future investigations are based on the results and limitations of the current research:

Sample size and diversity expansion

Bigger and Varied Samples: The reliability test was done on 60 participants, good enough to have an idea on the preliminary analysis but will not be enough in providing a broad spectrum on the results. Future research ought to consider a bigger and more diverse sample, incorporating students who study in varying areas, geographical locations and levels (e.g., undergraduate, postgraduate and doctoral students).

Multi-Institutional Studies: Future research needs to validate and implement the questionnaire in other universities, especially other universities that have similar distance education model in order to enhance the generalizability of the instrument. This will assist in determining the uniqueness or widespread of the challenges and opportunities identified to be either unique to AIOU or across institutions.

Longitudinal and Comparative Research

Longitudinal Assessment: The study design- longitudinal: this would assess the way students perceive CMS as time goes by, particularly as changes were made in the system, or even the policy itself. This would give clues on long-term usability and efficacy of the CMS.

Comparative Analyses: International comparisons in CMS can provide the best practices and improvements to be done by comparing the CMS of other open universities (e.g., Indira Gandhi National Open University, University of South Africa) against that of AIOU.

User Training and Technology Improvement

CMS Interface Enhancement: Since the problems with the CMS interface (e.g., lag, navigation, and glitches) rated lower, AIOU is encouraged to work on the user experience (UX) by simplifying the menu, mobile adaptation, and system performance during peak hours.

Training Programs: Much of the technical issues can be as a result of unfamiliarity among the users. AIOU needs to provide mandatory study and expert training to both the students and the faculty that incorporates video tutorials, live workshops, and step-by-step manuals on the functionalities of CMS.

Wider Expert Verification

Use of International Experts: The present validation was based on the past validation dependent on the experts of a concrete geographical and institutional context. To make sure that the use of the instrument can be relevant in international contexts, future research in the field should include international-level experts in digital learning and educational technologies.

Interdisciplinary Review Panels: Bringing in expertise in such disciplines as computer science, human-computer interaction (HCI) and data analytics may generate more information to improve the technical soundness of the CMS.

Constraints in qualitative Methods Elements of integration

Mixed-Methods Approach: Although the present paper employed a survey, in the future, it would be possible to combine the quantitative methodology with a qualitative approach (e.g., interviews, focus groups) to obtain rich information on the usability of CMS. Such would assist in revealing subtle issues that are not addressed by Likert scale answers.

Open Ended Feedbacks: It would be a good idea to add open ended questions to the questionnaire which will give the respondents a chance to comment on their experience and give more data to help to improve the system.

Policy and Administrative reforms

Routine CMS Assessment: AIOU needs to carry out regular assessment of the CMS such that this proven tool is being administered as per the periods that will help in checking the current progress and working on the arising matters.

Stakeholder Involvement: to make CMS more effective, it is always advisable to involve students, faculty, as well as administrative personnel in the process of its development and decision making. Users should be given a platform where they provide suggestions and feedback and the feedback given should be addressed in time.

Investigation of New Technology

AI/Chatbot: AI-powered chatbots can help answer frequently asked questions (e.g., how to apply, examination dates, etc.) and decrease the need to consult a person.

Blockchain as Secure Transactions: The usage of blockchain technology would protect the security of the information, especially in paying fees and grades.

The instrument has been proven and it is a reliable instrument on assessing the experiences of CMS, but it can be made more complete through its wider use, constant improvement and measurements with the policies of the institution. By correcting the shortcomings of the current research, as well as following the suggestions proposed in the current research, AIOU and other institutions like it can improve their online learning environment to ensure the continued user-friendliness, efficiency, and adaptability to the needs of distance learning of CMS platforms. Our future research in building on these results can develop adaptive, technology-driven solutions that enable the creation of a smooth operation of academics and administration.

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Appendix-A
Instrument / Questionnaire

Topic: Exploration of Prospects & Challenges of Campus Management System in Allama Iqbal Open University
Participant No.: _____   Date: _____
Note: Please mark tick (✔) at the relevant column/place.
Dear Respondent, the only goals of below data collection are educational, and research related. Your responses will always be kept secret, and will not be used for any other purpose.

Demographic details:

1	Name (optional)	
2	Age	20-25 26-30 31-35 36-40 41-45 Above 45
3	Gender	Male Female
4	Area*	Rural Urban
5	Education*	MS/M.Phil. Ph.D.
6	Experience	0-5 6-10 11-15 16-20 Above 20

Please mark your responses according to the below mentioned key:

Strongly Disagree (SDA)=1	Disagree (DA)= 2	Neutral (N) = 3	Agree (A) = 4	Strongly Agree (SA) = 5

Objectives	Items	SDA	DA	N	A	SA
Identify the perceptions of learners and faculty members regarding Prospects of Campus Management System (CMS) in AIOU.	**RQ1: What are the experiences of learners regarding guidance provided to use CMS to enhance their user experience?** **Subscale 1: Guidance on CMS for New Admissions**					
	Admission instructions on CMS are clear for me at the time of admission form submission.	1	2	3	4	5
	I faced no difficulty in uploading my application form on CMS.	1	2	3	4	5
	CMS provided ease of editing application and removing objections online.	1	2	3	4	5
	CMS has saved time of applicants (now they do not need to come in campus from their busy schedules).	1	2	3	4	5
	Intimation system (SMS/email) on CMS is quick and helpful for upcoming admission schedules.	1	2	3	4	5
	Subscale 2: Guidance on CMS for Courses					
	The system responds quickly to my actions of selection of courses.	1	2	3	4	5
	All the courses in the continuing semesters are	1	2	3	4	5

	visible to me on CMS.					
	Subscale 3: Guidance on CMS for Exams					
	I can download my exam centre details from CMS.	1	2	3	4	5
	I can download roll number slip from CMS.	1	2	3	4	5
	I can send request in case of change of exam centre by using CMS.	1	2	3	4	5
	RQ2: How do learners perceive the potential benefits of technological advancements in the CMS? **Subscale 4: Technological Advancements Benefits**					
	The system responds quickly to my actions.	1	2	3	4	5
	The mobile version of the CMS is user-friendly.	1	2	3	4	5
	The buttons and menus on CMS interface are clearly labelled and understandable.	1	2	3	4	5
	I feel it easy to create new service request at CMS interface.	1	2	3	4	5
	RQ3: What are the experiences of learners about their academic progress and convenience while using CMS? **Subscale 5: Clarity & Helpfulness in Academics**					
	The instructions provided about the CMS for completing academic tasks are clear and easy to follow for me.	1	2	3	4	5
	The online help resources on CMS are helpful and informative.	1	2	3	4	5
	The CMS customer support team is responsive and provides helpful assistance when needed.	1	2	3	4	5
Explore the experiences of Learners and faculty members regarding Challenges of Campus Management System (CMS) in AIOU.	**RQ1: What specific challenges do learners face in adapting to the current CMS interface and technical aspects?** **Subscale 6: Current CMS Interface Challenges**					
	The current CMS interface is functioning smoothly without frequent glitches.	1	2	3	4	5
	Using the current CMS interface takes more time than expected to complete my routine academic tasks.	1	2	3	4	5
	I usually lose important information i.e. exam etc. on CMS due to its system inefficiency or improper working.	1	2	3	4	5
	The current CMS interface is tricky and causes wastage of my time.	1	2	3	4	5
	I cannot concentrate on different sections of current interface of CMS.	1	2	3	4	5
	The current CMS interface frequently stuck.	1	2	3	4	5
	The data on the CMS is accurate and up to data	1	2	3	4	5
	Subscale 7: Technical Challenges of CMS					
	I rarely experience technical problems that hinder my ability to use the system.	1	2	3	4	5

I need help from others while using CMS independently.	1	2	3	4	5
CMS has created technological challenges and high internet connectivity demand.	1	2	3	4	5
Different menus in current CMC interface are difficult to execute.	1	2	3	4	5
Technical problems of CMS make me nervous.	1	2	3	4	5
The system performs badly during periods of peak usage.	1	2	3	4	5
RQ2: How do learners perceive the impact of challenges such difficulties in the admission process? **Subscale 8: Challenges in Admission Process**					
Due to CMS challenges, there is delay in processing admission application form in time.	1	2	3	4	5
Due to CMS challenges, I take expert's help when filling my admission form and uploading it.	1	2	3	4	5
CMS technical issues prevent in time messages regarding continuing semester details.	1	2	3	4	5
CMS technical issues prevent in time fee deposit.	1	2	3	4	5
CMS technical issues hinder in time access of tutor's details.	1	2	3	4	5

Appendix-B
CVI

Content Validty Index												
Items	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Expert 8	Expert 9	Expert 10	Expert 11	
Q1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q3	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	
Q4	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q5	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	
Q6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q7	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	
Q8	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q9	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q11	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q12	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q13	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q14	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q15	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q16	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	
Q17	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	
Q18	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q20	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q22	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q23	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q24	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q26	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q27	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q28	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	
Q29	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	
Q30	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q31	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q32	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q33	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	
Q34	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Q35	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	
												S-CVI
	0.91	0.89	1.00	1.00	0.83	0.97	0.97	0.94	0.97	0.94	0.94	0.94

Annexure - C
Certificate of Validity

This is to certify that the questionnaire titled *"Exploration of Prospects and Challenges of the Campus Management System (CMS) at Allama Iqbal Open University"* developed by Ms. Madiha Bashir, scholar of Allama Iqbal Open University has been reviewed and found to be valid for the purpose of data collection. The items included in the tool are appropriate, relevant, and aligned with the research objective. List of the professionals /experts who validate the instrument is given below:

Sr. No.	Name	Designation
1.	Dr. Muhammad Tanveer Afzal	Assistant Professor (AIOU)
2.	Dr. Muhammad Athar Hussain	Associate Professor (AIOU)
3.	Dr. Azhar Mumtaz Saadi	Assistant Professor (AIOU)
4.	Dr. Muhammad Safdar	Principal (FDE)
5.	Dr. Muhammad Asif	Assistant Professor (FUUAST, Islamabad)
6.	Dr. Arshad Mehmood Qamar	Lecturer (AIOU)
7.	Dr. Malik Adil Pasha	Assistant Professor (FUUAST, Islamabad)
8.	Dr. Jamil Bajwa	Professor (FCE)
9.	Dr. Riffat Naseem Malik	Professor (QUA)
10.	Dr. Muhammad Zafar Ullah	Assistant Professor (R I U)
11.	Dr. Sheikh Tariq Mehmood	Assistant Professor (IIUI)