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A Comprehensive Review of Pharmacy College Websites as Content Management System: Trends, Challenges and Opportunities

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Abstract

Websites is the face of an organization. It is the key tool in the virtual world. The increasing reliance on digital platforms in higher education has made the content management system (CMS) an essential tool for enhancing communication and accessibility to resources. Pharmacy colleges, in particular, are increasingly leveraging their websites as robust CMS platforms to provide students, faculty, and stakeholders with relevant academic and research resources. This review examines the current trends, challenges, and opportunities in the development and management of pharmacy college websites as CMS. By analyzing the structure, content delivery mechanisms, and interactive features of these websites, this study highlights their role in promoting effective learning and administrative efficiency.This study critically explores these challenges and their implications on the digital experiences of students and staff in pharmacy colleges, stressing the need for continuous improvements in website management. The review also identifies significant opportunities for pharmacy colleges to enhance their digital presence and educational outcomes through better CMS utilization. Incorporating AI-driven tools, enhancing mobile optimization, and integrating personalized content are promising strategies for improving user engagement and learning experiences. Total 50 pharmacy college library websites were taken into consideration for analysis. Content analysis method applied for the study. The study discusses how pharmacy colleges can leverage CMS to foster collaboration, streamline administrative processes, and ensure long-term sustainability in the digital age.

Keywords: Pharmacy college websites, Content management system (CMS), User experience, Website accessibility, Educational technology, Online learning resources

1. Introduction:

Websites are the face of an organization. It is the key tool in the virtual world. This is the current scenario in the changing higher education landscape, where the digital domain becomes increasingly important as a vehicle for altering the means of delivering educational content and administrative services. Pharmacy colleges, just like every other academic institution, make use of their websites as a Content Management System (CMS) in making access to information relatively easy for students, faculty, and other constituents alike. The bulk of these present resources available for academics, research publications, course materials, and institutional announcements. Pharmacy college websites today are increasingly being recognized not as the stores of mere information but as an interactive media towards enriching learning and streamlining administrative work (Ghadge et al, 2024).

Content is the king of today's marketplace. It can make youths employable to some extent. (Gaikwad, 2016). However, several challenges exist with regards to delivering the best possible user experience in CMS pharmacy college websites, as they have the potential to realize well-rounded benefits. Some of the drawbacks are content

that keeps getting outdated, limited interactivity, and most importantly, the sites are not mobile optimized. Apart from these challenges, resources in terms of finance and personnel are required to secure, access, and maintain it as user-friendly. Many institutions fail to reach the required level of technological capacity; thus, CMS remains either underutilized or inadequately managed. These restrictions are as much a burden on the ability to learn on behalf of the students as on the administrative efficiency of an institution.

Development and deployment of CMS on pharmacy college web sites followed broader trends in educational technology. Yearly, the CMS platforms have shifted from static information-based web pages to more interactive, user-centered digital spaces. Such features as online enrollment portals, digital libraries, virtual classrooms, or collaboration tools gradually are being implemented into pharmacy college websites (Gaikwad, 2014). This aimed at general improvement of student participation, effective access to learning resources and increased communication between lecturers and students. However these improvements came along with challenges in that many pharmacy colleges found difficulties in managing and maximizing these online tools.

There are many opportunities for pharmacy colleges to bridge these gaps, and take advantage of emerging trends in design and functionality of CMS. Pharmacy colleges can use innovations such as AI-driven content personalization, advanced analytics for tracking user engagement, and mobile-responsive designs in giving their websites a new look that makes them easy to access and very useful to students, lecturers, and other stakeholders. This extensive review will explore current trends, identify key challenges, and outline future opportunities for pharmacy college websites as a content management system with valuable insights for educators, administrators, and digital content developers in the pharmacy education sector.

2. Background of Study:

Digital technologies have changed the way of communication and the routes of distribution of information among and between the educational institutions, students, and the stakeholders. As an example, the applicability of a Content Management System has helped the educational institutions such as pharmacy colleges express more structured, user-friendly, and effective channels of communication through the websites. A CMS will make an institute create contents, monitor and track their usage, and provide academic resources without seeking much technical expertise. Due to changing needs of pharmacy education, CMS have become an important tool since colleges are being charged with the responsibility of meeting the changing needs of digitally savvy students, faculty, and researchers.

Notwithstanding these improvements, quite a lot of areas need to be improved for better design, management, and optimization of CMS on websites of pharmacy colleges. Most institutions will find it nearly impossible to keep their websites fresh, relevant, and responsive to diverse stakeholders' needs. Obsolete or irrelevant content, no personalization, and minimal mobile compatibility can result in a suboptimal user experience. Indeed, very few pharmacy colleges in developing regions possess the material or technical capabilities to install or continue using higher-level CMS features. These issues have created much debate over the future practice of installing CMS tools into educational websites, especially within the pharmacy arena, where more unique academic and research needs are generated (Burns et al., 2024)

Earlier, pharmacy colleges had websites that were meant mainly as static resource centers in providing information - course catalogues, contact details, and institutional announcements. However, when e-learning, distance education, and online administration attract emphasis, these websites have undergone huge expansions in scope. Pharmacy colleges today employ CMS-enabled websites for a gamut of purposes such as managing courses online, virtual labs, e-library access, and communicating with the students by their faculty. This has helped them align with the global trend of digital education, where access, convenience, and efficiency are arguably essential to quality academic experience. The study makes an attempt to provide a comprehensive review of trends, challenges, and opportunities in CMSs for websites of pharmacy colleges. This review encompasses dissemination of content, user experience, technological integration, and institutional strategies, identifying successes and shortcomings in current practices. It also discusses how college pharmacies may take advantage of new technologies such as artificial intelligence to remove present barriers and improve the digital experience of students, academics, and administrators. It is through this exploration that the paper finds its contribution within the newly emerging library of studies on educational technology in pharmacy in providing insights that could inform future implementations and innovations of CMS.

3. Scope and Significance of Study:

This study holds relevance because it will inform educational administrators, digital content managers, and policymakers of the current state of CMS in pharmacy education. Since these sites are fast becoming central nodes of communication in issues concerned with academics and delivery of academic content, an overview of strengths and weaknesses of implemented CMS systems should be noted. Pharmacy colleges, more especially, present challenges distinct from those of other academic institutions due to the specialist curriculum, research interests, and academic resources. This research paper addresses all this as it critically examines the extent to which pharmacy college websites cater to the needs of its users both in terms of education and operations. There are various trends, challenges, and opportunities arising from their implementation in the age of information and communication technology. The scope of this review is an in-depth analysis of the features, usability, and effectiveness of CMS in pharmacy institutions around the world (Harisanty et al., 2024). This also considers the way these systems are used to serve academic functions, facilitate administrative activities, and enhance user experience. By examining pharmacy college websites, this research attempts to depict outstanding practices in the utilization of CMS and areas that need improvement, as much-needed information for educational institutions seeking to optimize their digital presence will come. In so far as it captures trends and solutions broadly applicable across different educational contexts, this review makes its contribution towards the debate about the future of higher education in technology and the place of technology as a tool for augmenting the learning and teaching process. In the wake of most institutes implementing digital transformation, lessons drawn from Pharmacy College websites' CMS implementation can now be used as a benchmark to other disciplines on properly understanding the best practices and thus spur innovation in the higher education sector.

It is important to identify the emerging opportunities and tools that enable pharmacy college websites to function more digitally. Laying out recent advancements in CMS technology-issues related to artificial intelligence, data analytics, and mobile optimization-the study provides forward-looking direction on how pharmacy colleges can better serve their stakeholders. These innovations have the potential to change not just user experience but also the administrative efficiency of these institutions to compete in an increasingly digitized educational landscape. The study further underlines factors making accessibility, inclusivity, and user-centeredness so crucial in creating a successful and engaging digital environment for students and faculty.

4. Objectives of Study:

- To examine how pharmacy colleges worldwide are adopting and utilizing Content Management Systems (CMS) technology on their websites (in terms of design, structure, and features
- To identify the major challenges faced by pharmacy colleges in maintaining and optimizing CMS-enabled websites
- To evaluate the impact of CMS on the academic and administrative efficiency of pharmacy colleges (academic learning experiences and institutional administrative processes)
- To explore emerging technologies and strategies that can improve CMS functionality on pharmacy college websites
- To suggest some of the best practices for optimizing CMS implementation in pharmacy colleges to support academic growth and institutional operations

5. Reviews of Literature:

The role of Content Management Systems (CMS) in higher education has been widely studied, with research indicating that CMS platforms are critical tools for streamlining information dissemination, enhancing learning experiences, and facilitating administrative efficiency. In the broader context of digital education, studies have highlighted how CMS enables the organization and presentation of content in a user-friendly manner, making it accessible to a diverse audience of students, faculty, and administrators. Various scholars have noted the growing adoption of CMS in academic institutions as a way to centralize resources, manage online courses, and enhance communication (Al-Mahmood & McLoughlin, 2021). This literature forms the foundation for understanding how CMS is used in pharmacy college websites.

The several studies have explored the unique demands that pharmacy colleges face when implementing CMS. Given the specialized nature of pharmacy curricula, research, and clinical practice requirements, studies emphasize the need for CMS platforms that offer comprehensive tools for managing not just theoretical learning

materials but also practical resources such as virtual labs and clinical training modules (James et al., 2019). Researchers have found that while pharmacy colleges are increasingly adopting digital tools for content management, there remains a gap in terms of fully optimizing these systems to meet the needs of their academic programs. This suggests that CMS in pharmacy colleges requires more tailored solutions compared to other academic fields.

One recurring theme in the literature is the challenge of maintaining and updating CMS platforms in higher education institutions. Studies indicate that many colleges, including pharmacy institutions, struggle with issues such as outdated content, limited interactivity, and technical barriers to maintaining responsive and accessible websites (Nguyen & Belk, 2020). Additionally, poor user experience, lack of mobile optimization, and inadequate technical support further complicate the efficient operation of CMS platforms in pharmacy colleges (Ahmad et al., 2020). These studies provide critical insights into the operational hurdles that educational institutions face when managing CMS platforms.

Recent literature also explores the potential of emerging technologies to enhance the functionality of CMS in educational settings. Studies have highlighted the role of artificial intelligence (AI), machine learning, and data analytics in improving CMS performance by personalizing content for users, enhancing navigation, and optimizing resource management (Smith & Johnson, 2022). Research also suggests that mobile-friendly designs and user-centered approaches are essential for ensuring the accessibility and effectiveness of CMS in pharmacy colleges (Patel & Kumar, 2021). These technological advancements are key opportunities for pharmacy colleges to improve their digital presence and the overall educational experience.

6. Research Methodology:

Content analysis method is used for the present study. Total 50 websites were analyzed for the present study. Hence, the sample size remains 50. Chi-Square test is applied to test the hypothesis

- **Hypothesis of Study:**

H0: There is no significant association between the presence of interactive features on college websites and student engagement levels.

H1: There is significant association between the presence of interactive features on college websites and student engagement levels.

7. Results:

Here is the Chi-square test result presented in a table below:

Table 1: Chi-Square Results

Observed Values	Websites with Interactive Features	Websites without Interactive Features
High Engagement	30	10
Low Engagement	5	5
Expected Values	**Websites with Interactive Features**	**Websites without Interactive Features**
High Engagement	28	12
Low Engagement	7	3

Test Statistic	Value
Chi-square statistic (χ^2)	1.34
p-value	0.247
Degrees of Freedom (df)	1

Interpretation: Since the p-value (0.247) is greater than the standard significance level (0.05), we fail to reject the null hypothesis. This suggests that there is no statistically significant association between the presence of

interactive features on college websites and student engagement levels based on this sample of 50 students.

8. Discussion and Analysis:

The increasing adoption of Content Management Systems (CMS) in pharmacy college websites reflects a broader trend in higher education toward digital transformation. CMS platforms have revolutionized how pharmacy institutions deliver educational content, manage administrative tasks, and foster communication among students, faculty, and administrators. Through a detailed analysis of various pharmacy college websites, several key trends, challenges, and opportunities emerge, providing valuable insights into the effectiveness and areas for improvement in the use of CMS.

a. Current Trends in CMS Utilization:

The prominent trend of such research indicated the fast uptake of technology within pharmacy college websites for use as supportive tools for academics and administrative purposes. Many institutions offering pharmaceutical training courses have introduced online course management, virtual labs, digital libraries, and student portals to ensure increasing access to educational materials. Such structures also provide effective channels for communication from which, at any one time, specific details on coursework, institutional announcements, and examination schedules may be published. Besides, advanced CMSs support not only multimedia content but also video lectures, tutorials, and even interactive assessments to cater to the different needs of the learners at pharmacy colleges. Another interesting observation is that pharmacy colleges are using diversified types of sophistication in such systems. Some institutions have already utilized advanced technologies, such as AI-driven content recommendations and analytics in student performance analysis. Others settle with merely bare content delivery systems. This gap underlines an uneven digital acceptance among pharmacy colleges, and instead, seems to be largely driven by institutional resources and geographical locale together with administrative priorities.

b. Challenges Faced by Pharmacy Colleges in CMS Implementation:

CMS has various advantages but a host of challenges prevent its optimum functionality in pharmacy colleges. The most prevailing one is the stale content. Mostly it leads to low customer interaction and loss of trust. Most websites for pharmacy colleges reviewed in the scope of this research included obsolete content. Keeping content fresh is key to the timeliness and usefulness of CMS platforms, but many institutions do not have the personnel or resources to make sure their information remains current. There is often little interactivity and bad user experience on many pharmacy college websites. Where a CMS platform seeks to provide a richly dynamic learning environment, many sites are missing interactivity with static content consisting of PDFs or text-based announcements. Moreover, the user interface and navigation of many pharmacy websites are not very intuitive for students and faculty to find the relevant information effectively on these websites. Mobile optimization is another major issue as several pharmacy college websites do not fully appear responsive to mobile devices limiting the access to the websites of students who use smartphones for learning and communication purposes.

c. Opportunities for Enhancing CMS on Pharmacy College Websites:

There are excellent opportunities that exist in the process of implementing and improving CMS in Pharmacy College for better usage. AI and ML can be blended in content management systems to enable personalization for students. Analyzing user behavior and preferences, AI-dependent CMS can suggest recommendations to students that best fit their interests, engage more students, and improve quality. Pharmacy colleges will also be able to investigate more advanced analytics on student progress, participation in courses, and where further support is required.

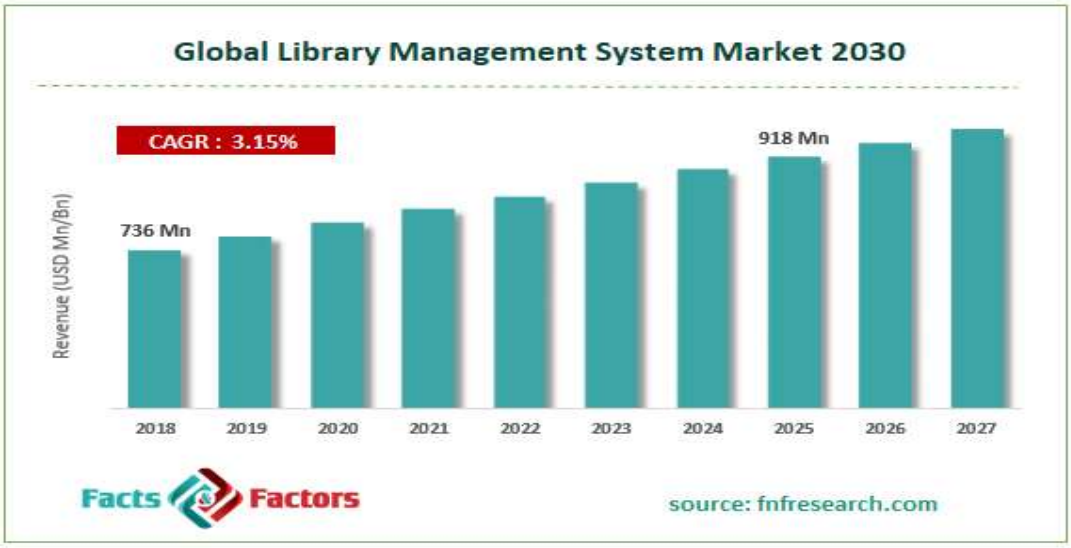
However, in the realm of mobile-friendliness and the design of accessible interfaces, pharmacy colleges still have some considerable room for improvement. Full responsiveness of the websites is essential on mobile devices to engage increasingly with the educational content on the go. Interactivity is another area where potential for development exists in CMS options such as virtual simulation, quizzes, and collaboration tools that facilitate more active experiences of learning. One area where CMS platforms could be used is for supporting interdisciplinary collaboration. Pharmacy education is normally undertaken, hence requiring inter-intradisciplinary collaboration, and CMS platforms support this kind of learning by providing for collaborative resource sharing, access to discussion forums, and integrating various project management tools. By facilitating a more collaborative kind of learning environment, CMS platforms can enhance the academic as well as professional development of the pharmacy students.

d. Impact on Academic and Administrative Efficiency:

CMS platforms can bring much-needed improvement to both academic and administrative efficiency in pharmacy

colleges. CMS thus provides for access to learning resources in centralized form that saves the precious time searching for the students. Even, the efficiency of communication tools, automatic grading systems, and even the evaluation room would save faculty members more direct time spent teaching rather than in administrative work. CMS platforms also coordinate better, in terms of the processes of the institution: enrolling students, course scheduling, and exam management. The effectiveness of a CMS platform is determined by its design and implementation. In general, the more user-friendly and regularly updated a CMS platform is, the higher the rates of utilization are likely to be together with better academic performance. Poorly maintained or outdated CMS platforms are likely to be inefficient, confusing, and disappointing. Indeed, the analysis does point to the fact that adequate resources would need to be provided by the pharmacy colleges for the proper maintenance and upgrades of their CMS platforms for these systems to be appropriately placed in regard to enhancing academic success and operational efficiency.

Figure 1: Global Scenario of Library Use



The above report is published by Facts and Factors Search. The company market share analysis is included in the report as a part of a general overview of the key players within the market. Furthermore, the report also includes some major strategic developments of the market such as acquisitions & mergers, new product & service launches, agreements, partnerships, collaborations & joint ventures, research & development, and regional expansion of major participants involved in the market on a global and regional level. The study gives an authoritative view of the U.S. Library Management System market by segmenting the market based on type, solution, end-user, and regions. All the segments have been analyzed based on present and future trends and the market is estimated from 2019 to 2025. The U.S. Library Management System market is expected to be driven over the forecast period due to growing student population base availing the library services. However, high penetration of open source library management software will be a significant growth detractor of the U.S. library management system industry over the forecast period. Nevertheless, increasing customization of the library management systems to cater to the needs of the members of the library will provide new facades of growth for the market in the U.S. over the forecast period.

9. Findings of Study:

- In the conducted study, it was established that the Content Management Systems (CMS) have become a crucial part of most of the pharmacy college websites' digital infrastructure. With such portals, they are not only used for dissemination of academics-related content but also mainly for every day administrative work, communication, and accessing and utilizing other sources such as digital libraries, and virtual learning resources.
- The variation in the sophistication and functionality of the CMS platforms across the pharmacy colleges has been high. Some institutions use advanced CMS platforms that include AI-based content personalization and mobile optimization with data analytics, while other institutes may just use a static

delivery system. Such variations are mostly attributed to institutional resources, technical expertise, and geographical location.

- A major finding is that many pharmacy college websites fail to update their CMS platforms on time, which, as a result leaves with outdated content and poor engagement in terms of user experience. These problems such as too little interactivity, complex navigation, and being non mobile responsive also have major impacts on user experience. These factors cut across all that CMS purported to deliver for the educational experience among students and faculty members.
- It is found that interactive features like virtual labs, online quizzes, and collaborative tools within the CMS platforms of most pharmacy colleges are not being utilized very frequently. Though such tools can significantly upgrade the learning experiences, a lot of websites are still providing static content. This lack of interactivity drastically limits the use of CMS platforms for quite dynamic engagement with the students.
- Pharmacy colleges have a huge scope to enhance the CMS systems with emerging technologies such as AI in content recommendations, advanced analytics for tracking user engagement, and mobile-responsive designs as key improvements over the current features and the ability to serve the best to the users.
- According to the study, people now depend more on their mobile to achieve school facilities, and the call for optimization in the pharmacy college website becomes more urgent. Many other CMS sites are not optimized for use in mobile devices either, and access to information falls usually from a smartphone. This is where actually students mainly access academic papers and communicate with others.
- A CMS platform maintained with a totally well-working place helps attain excellence in academic as well as administrative efficiency. Besides the above functionalities, students get accessibility towards learning resources with SMS. It also enables effective communication as well as online assessments. Among these, automation of tasks like grading, scheduling, and student management for teachers and administration helps them have time for other activities in academia.

10. Conclusion:

The comprehensive review of pharmacy college websites as Content Management Systems (CMS) highlights the pivotal role these platforms play in modernizing educational delivery and enhancing administrative efficiency. As digital transformation continues to reshape the landscape of higher education, pharmacy colleges are increasingly leveraging CMS to provide streamlined access to resources, foster communication, and support learning experiences. The findings of this study indicate that while there is significant progress in adopting CMS technologies, disparities in implementation and effectiveness persist across institutions. The general conclusion of the study is that institutions such as colleges and schools of pharmacy that emphasize updating, user-centric design, mobile-readiness, and active utilization of interactive tools offer higher levels of user satisfaction and engagement. Investment in advanced CMS technologies is likely to make the institution agile enough and responsive to its students' and faculty's ever-changing needs and, therefore, contribute to better academic performance and operational effectiveness. The study also uncovers considerable opportunities for improvement. By integrating emerging technologies such as artificial intelligence, data analytics, and mobile-responsive designs, pharmacy colleges can transform their CMS platforms into more dynamic, user-friendly environments. These advancements can help institutions meet the diverse needs of their students and faculty, ultimately leading to improved academic outcomes and operational efficiencies.

The analysis reveals that many pharmacy college websites face critical challenges, including outdated content, limited interactivity, and inadequate mobile optimization. These issues not only hinder user engagement but also detract from the overall educational experience. Moreover, the underutilization of interactive features suggests that there is an untapped potential for enhancing student learning and engagement through innovative digital tools. For pharmacy colleges to fully harness the potential of CMS, they must prioritize regular content updates, user-centered design, and the incorporation of interactive features. By addressing current challenges and embracing technological innovations, pharmacy colleges can enhance their digital presence and better support the educational journey of their students. As the higher education landscape continues to evolve, the insights gleaned from this study can serve as a valuable guide for pharmacy colleges aiming to optimize their CMS platforms for a more

effective and engaging educational experience.

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