

AN EMPIRICAL STUDY OF POPULAR CONTENT MANAGEMENT SYSTEM - WORDPRESS VS DRUPAL VS JOOMLA

Muhammad Iqbal¹, M. Noman², Samar Raza Talpu³, Amir Manzoor⁴ and Malik Muneeb Abid⁵

^{1,2}Department of Computer Science, Bahria University, Pakistan

³Department of Information and Communication Technology, Sukkur IBA University, Pakistan

⁴Department of Management Sciences, Bahria University, Pakistan

⁵Department of Civil Engineering, International Islamic University, Pakistan

Abstract

In the modern world, the absence of a business website means loss of a significant share of the tentative market. A business website helps businesses become round the clock accessible to the world. In the past, website development required a significant amount of time, computing knowledge, and skills. Content Management System (CMS) is a new website creation toolkit to address these problems. A CMS converts the complex process of website development into a simple workflow. A CMS requires no prior knowledge/experience and significantly reduces the time of developing a website.

Today, many CMS platforms are available for users. This increase in the number of CMS platforms has made it difficult for a user to choose the best one. The objective of this study is to provide a comprehensive comparison of the available CMS platforms. This study performs a comparison of the three most popular CMS platforms (i.e. WordPress, Joomla, and Drupal) using a comprehensive set of criteria. For this purpose, a convenient sample of 110 students from the Computer Science Department and Management Sciences Department was used. These students had used one or more of the CMS platforms to develop websites. The results reveal that WordPress is the dominating CMS platform due to its technical capabilities and ease of use.

Keywords:

CMS, Web Development, WordPress, Drupal, Joomla

1. INTRODUCTION

The content is any form of information, which the user needs or obtains. Some examples of content include text, images, videos, art, white papers, software, or any other type of such information. This content is stored and retrieved by the users in many forms throughout the ages [1]. The increases in the size of content led to the need for some form of management. Therefore, the need for Content Management aroused in every form, in written, digital, or in the form of web. However, modern-day content management mostly comprises of the web. The web has gone through major transformation over the years. We first witnessed birth of Web1.0, which was mostly comprised of the websites that comprised of static pages. These websites offered only one-way communication and were built using three core web technologies i.e. HTML, HTTP and URL [2] [14].

Static websites limit the users to only reading the information present on the website and no other interaction was possible. The need to interact with the user/customer led the evolution of Web 2.0 with dynamic websites that had both the reading and writing functionalities, which meant that the website owner could now interact with the user and vice versa. Dynamic websites got very famous quickly and many people/companies started to develop their websites to have a virtual appearance on the internet. The problem in dynamic website is that the development of such

websites still requires knowledge of scripting and development languages. Those who do not know how to code are at disadvantage. Thus, the advancements in hardware and software technologies led to the evolution of modern-day CMS, through which anyone can design a website without having any knowledge about programming or coding. Content Management Systems are software applications, which are used to create and manage digital content [2] [3].

Content management systems, in brief, means the collection, management, and publishing of content. As the development of content management systems started to get more and more popular, open-source, and better solutions came out in the market [4]. The most common advantage of having these open source content management systems is that a large community of developers is making improvements in these systems by each passing day, making it better and better for people to use. Present-day CMS has made life easier for those who do not know how to code but still need to make a website for themselves or their organization. When we discuss open source content management systems, three names are widely used these days, which include WordPress, Joomla, and Drupal [5].

This study aims to investigate the important factors which are part of the widely used CMS, WordPress. Indeed, WordPress has acquired maximum market share among the popular CMS platforms [13] and WordPress is also used by popular brands across the world. To cross-verify this claim, this study uses a questionnaire that was conducted on a sample of students conveniently selected from two departments of Bahria University: Department of Computer Science and Department of Management Sciences.

In Section 2, the study provides review of relevant literature. Analysis and evaluation of the data presented in section 3. The conclusion will be discussed in the last section.

2. AN INTRODUCTION ON CMS

Web Applications are playing an important role in business, start-ups, and portfolios. Everyone needs a website based on creativity and ease of use. Furthermore, it is what makes or breaks the reputation of the company or individual. Making a website involves lot of hassle if one does not know how to code. But, CMS allows you to design the websites according to your needs without any knowledge of coding. The top three open-source content management systems, which are widely used to make websites are WordPress, Joomla, and Drupal. Now, how does one decide on which of these three to use when developing a website [6].

The Fig.1 depicts the three-major steps of CMS. The first step is content creation, as we know that the front-end of the CMS has

an easy interface that can be used to create new pages or update the content, without knowing any HTML. The content management is nothing but the range of workflow capabilities that are provided by CMS once a page is created. The content can be easily managed after creating any page as it is saved in a repository and is updated as you change anything. CMS provides features that can be used to enhance the capability of the sites, which come in content presentation. For example, it will understand the repository and will create site navigation by itself for the user to use [4] [7].



Fig.1. Anatomy of CMS

As illustrated in Fig.2, the information is gathered and molded throughout the CMS to publish it into the webpages. The first two components are the user requirements and business strategy. These are the initial steps to gather information, which is needed for the publishing of the website. Then, there is a publishing process. An information architecture (IA) ensures that the foundation is stable, and that the website will be durable and scalable. The content audit makes sure that the content is authentic and compatible with the requirements. All the next steps are used to transform the content gathered into the form, which is needed to publish it into the webpages.

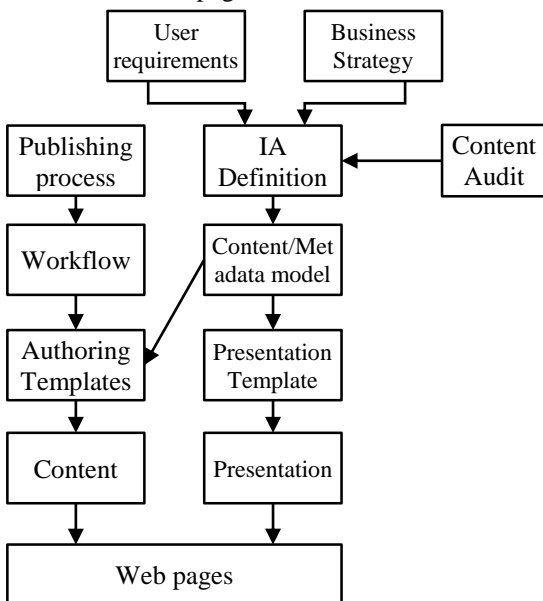


Fig.2. CMS Design Information Architecture

The general layered architectural components and their communications are shown in Fig.3. There are six main components. The bottom layer of any CMS architecture is the operating system. Afterward, the type of web server that you use and the databases you want. WordPress is using MySQL to store records in CMS. The scripting languages come next, then the framework and then the Plugins, which provide the extra functionality you need on the websites [8].

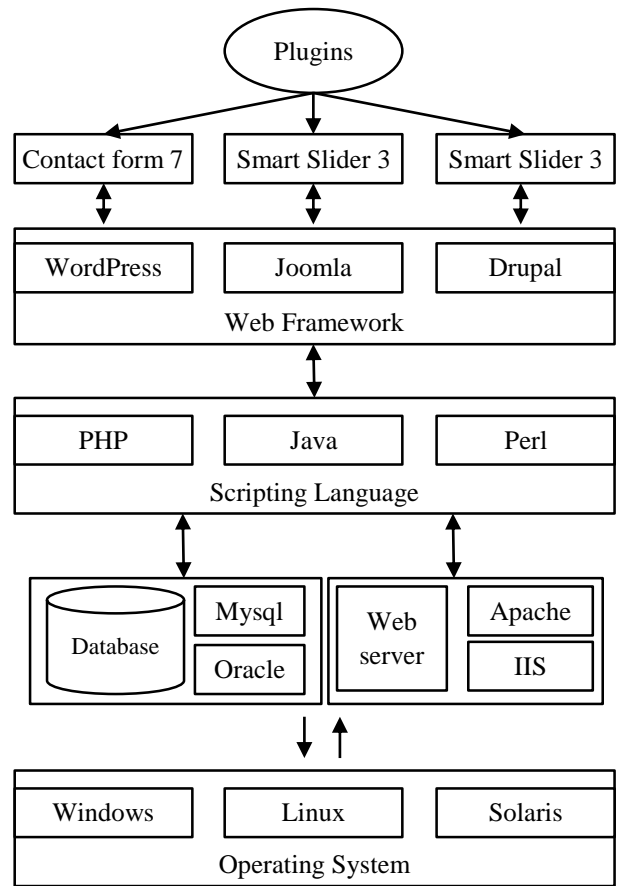


Fig.3. Layered Architecture of CMS

Joomla framework has gained reputation to become one of the robust CMS applications to create attractive websites. The Joomla Framework is illustrated in Fig.4. Joomla is built on various open-source software. Joomla modules, components, and plugins are used to extend the functionality of the base Joomla framework. For this same reason, they are called extensions. The modules are the lightweight extensions used in page rendering. They can be used to display data from a component and can stand on their own. The components are the most interacted with, and that is why they can be considered as ‘mini-applications’. The bits of code executed at specific event triggers are called plugins. The Joomla Framework can be extended by using powerful plugins. Moreover, Joomla provides an excellent and organized plugin facility for its users. Templates decide the aesthetic look of your website. The last part is the website. The website is the medium through which users interact with the organization [9] [10].

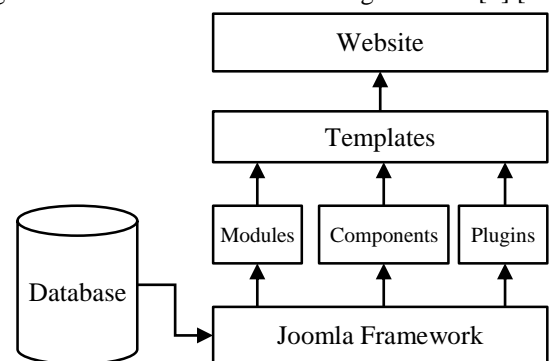


Fig.4. Joomla Architecture

For economic reasons, the open-source tools have always been a preferred choice for developing different web applications. A large number of users are using Drupal for website development due to multiple features, such as flexibility in content creation, easy administration of users, and the capability to handle complex workflow [14]. The Fig.5 is a graphical representation of Drupal architecture.

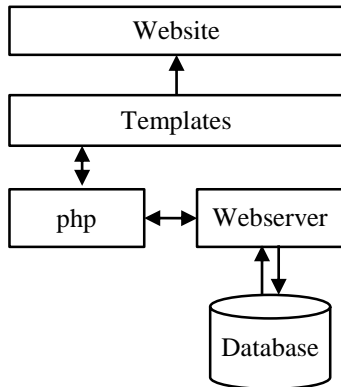


Fig.5. Layered Architecture of Drupal

The following steps highlight the Drupal CMS working:

- Users send the requests to the server through Drupal CMS, where Web browser acts as a client.
- Drupal CMS receives requests from the client.
- Drupal uses PHP to run user code.
- PHP sends user code via web server through HTTP protocol
- Database store user information

The Table.1 shows the comparison of the three CMS based on parameters like security, plugins, free themes, etc. According to the table, we can infer that WordPress is better from Joomla and Drupal in these parameters as mentioned in the Table.1. The only thing which lacks in WordPress and better in Joomla and Drupal is security. However, security can be implemented in WordPress by using plugins [6]. Moreover, the possibility of cyberattacks (such as SQL injection, DDoS, and Brute force attacks) can be avoided by website owners by implementing best network security practices. These best practices include use of strong passwords, use of SSL certificates, and change of the administrator root password, place limit on logins attempts (“WordPress CMS”, n.d.) etc.

Table.1. Attribute-based Comparison

Attribute	WordPress	Joomla	Drupal
Security	Moderate	Low	High
Plugins	45,000+	34,000+	7,000+
Demo Data Export	Yes	No	No
Mobile view	Yes	No	Yes
Website Analytics	Yes	Yes	Yes
Free Themes	4,000+	2,000+	1,000+
Medium	Easy	Medium	Medium
Widget Customization	Yes	No	No
Theme Customization	Yes	No	Yes
Max Upload Size	2MB to 150MB	2MB	10 MB

The Fig.6 shows WordPress is the most popular CMS among all. According to the latest data, WordPress has the highest CMS market share nearly 60%, and approximately 18 million websites worldwide run on WordPress. Joomla and Drupal have a market share of approximately 6.6% and 4.6% respectively [4, 11]. The Table.2 summarizes the study [4] [11] results.

According to the experience of different studies [8]-[10], surveys, and analytics, there are almost two billion websites online. Moreover, half of the websites of the world run on some CMS platforms.

Table.2. Market Share of Top 3 CMS

Time	WordPress	Joomla	Drupal
1 Apr 2019	58.8%	7.0%	4.7%
1 Aug 2019	59.3%	6.8%	4.7%
1 Dec 2019	59.9%	6.6%	4.7%
10 Mar 2020	60.1%	6.2%	4.2%

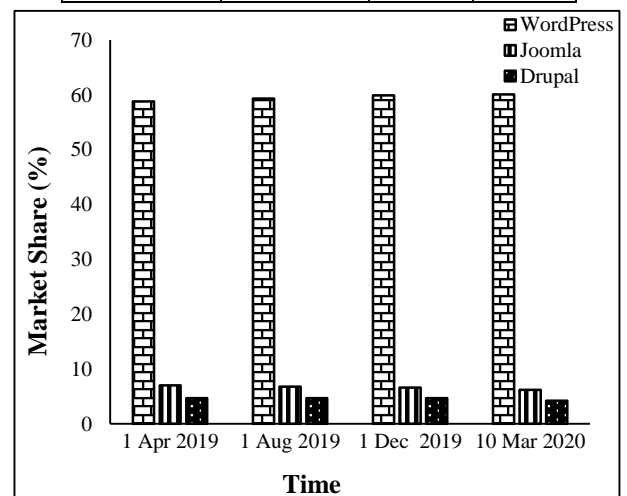


Fig.6. Market share of CMS Platforms

Table.3. System Requirements

WordPress			Joomla			Drupal		
Software Requirements	Required	Recommended	Software Requirements	Required	Recommended	Software Requirements	Required	Recommended
PHP	7.2 +	7.2 +	PHP	5.3.10 +	5.6 + or 7 +	PHP	5.2	5.2
						Drupal	6	6.25
						Java	1.6	1.6+
Supported Databases	Required	Recommended	Supported Databases	Required	Recommended	Supported Databases	Required	Recommended
MySQL	5.6+	5.6+	MySQL	5.1 +	5.5.3 +	MySQL	5.1	5.5+
MariDB	10.0+	10.0+	SQL Server	10.5 +	10.50 +	Apache Solr	1.2	3.3+
			PostgreSQL	8.3.18 +	9.1 +			
Supported Web Servers	Recommended	Supported Web Servers	Supported Web Servers	Required	Recommended	Supported Web Servers	Required	Recommended
Apache	2.4 +	Apache	Apache	2.x +	2.4 +	Web server	HTTP	Apache HTTP
Nginx	1.8 +	Nginx	Nginx	1.0 +	1.8 +			
			Microsoft IIS	7	7			

The Table.3 discusses the basic requirements and recommended versions needed by these three CMS to work. It discusses Software requirements, Database requirements, and web servers. We can see that the web server mostly recommended by all three is APACHE [12]. Moreover, different versions of PHP are also required by all three CMSs. The databases that can be used in these three are different but the common one is MySQL [4].

There are many differences between these selected CMS such that WordPress provides better web applications, e-commerce solutions than Drupal and Joomla. It also has a great SEO option because it has many plugins that can be used to improve for quick response in search engines as compared to other CMS.

To achieve better SEO results in Joomla and Drupal, extensions and modules are used. However, Joomla and Drupal do not have a high impact like WordPress. WordPress offers many extensions to add different functionality. However, other CMS does not offer such functionality. Joomla and WordPress have a larger user group as compared to Drupal because they both are easy to use and have a friendly user interface. On the other side, Drupal is very complex to manage and use. It has limited documentation as compared to other CMS as presented in Table.4 [11].

Table.4. Similarities and Dissimilarities of WordPress, Joomla, Drupal [12]

Characteristics	WordPress	Joomla	Drupal
Best used for	Blogs, E-commerce, online apps	Websites, online apps	Blogs
Availability of extension	High	High	Middle
Scope of functions	High	High	Middle
Extension depository	Distributed	Distributed	Centralized

Software documentation	Excellent	Excellent	Good
Group of users	Very active	Very active	Limited
Easy to use	Simple	Medium	Complex
User Expertise	Middle	Middle	Very High
Manual SEO option	Yes	Yes	Yes
Automatic SEO option	Plugins and tools	Extensions	Modules
Market share	65%	13%	8%
Active Websites	26,701,222	2,009,717	964,820
Total # of websites	239,139	13,480	23,330
Develop your template	Artisteer	Artisteer	Artisteer
Built-in templates	Yoo Downtown	Yoo Downtown	AT commerce
Footer and Header	Combined in template	Artical module	Combined in template
Image Slider	Combined in template	Nivo	Combined in template
Social networking	Social code	ITP social buttons	Social code
Translate	Google translate	Google translate	Google translate
Programmer	Permanent links widget	JNews	Recent content Section
Download Accelerator	WordPress download manager	Jdownloads	File downloader

Bulletin	Mail chimp website	Mail chimp website	Mail chimp website
Contact Form	C Forms II	CK Forms	Merged into kernel
Data Editor	Own	JCE	Own
Twitter, YouTube, Maps	By inserting HTML code provided by official websites	By inserting HTML code provided by official websites	By inserting HTML code provided by official websites
Login and search	Merged into kernel	Merged into kernel	Merged into kernel
Top Websites	BBC America, Sony Music, Time Inc, Harvard Gazette Online, Mercedes-Benz	The Hill, Linux.com, Harvard University, The Fashion Spot, Guggenheim	Tesla Motors, The Economist, Webster Bank, The University of Chicago, McDonald's Australia

3. METHODOLOGY AND EVALUATION OF DATA

To test and examine which of the CMS is being popular and used by the developer in the market, a survey of 110 students was conducted which comprised of 7 important factors. The candidates who were selected in our study were those who are using these three CMS for different purposes. The process of the survey is a single-stage method, where questionnaires were distributed among three distinct groups who are users of three widely used CMS platforms. Based on a single point scale, the candidate determines the significance of selected factors.

These factors are the Availability of themes or plugins, Process of activation, and ease of use. The other two factors are database issues and the facility of customizing the sites. The stages required to investigate the popularity of a specific CMS platform is depicted in Fig.7.

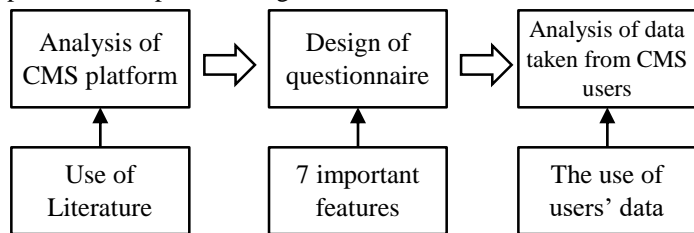


Fig.7. Stages of Assessment of CMS Platform Popularity

The first stage is the analysis of different CMS platforms with and aim to introduce the three widely used CMS architectures. The next stage is designing of the questionnaire, which aims to highlight the important features of the three widely used platforms. The questionnaire was designed and distributed among different CMS platform users who were acquainted with the CMS application. The last stage is the analysis of user’s data, which decides which CMS application is most popular among website

users. The Table.5 with data about the three popular CMS applications is visible in this stage. The Table.5 contains the selected important features which are common in all three CMS platforms.

Table.5. Survey Based Results (WordPress, Joomla, Drupal)

Variables	WordPress		Joomla		Drupal		No Comment	
	Yes	%	Yes	%	Yes	%	Yes	%
Theme	87	79	9	8.1	12	10.9	2	1.8
DB Issues	79	71.8	11	10	16	14.5	4	3.6
Activation	83	75.4	10	9	14	12.7	3	2.7
Customization	88	80	8	7.2	10	9	4	3.6
Responsiveness	84	76.3	13	11.8	11	10	2	1.8
Ease	92	83.6	7	6.3	8	7.2	3	2.7
Plugins	98	89	5	4.5	6	5.4	1	0.9

In addition, the current study suggests that these seven listed features are the most important factors to evaluate the strength and popularity of any CMS platform (Table.5). The analysis of the responses of our survey has highlighted several important evaluation criteria that users could use when selecting one of these three widely used CMS platforms. The Table.5 indicates that WordPress outperforms the other two CMS platforms on all evaluation criteria. The results also reveal that “Plugin”, “Ease”, and “Customization” are the most important and popular features of WordPress.

The Fig.8 shows the results of the survey of different CMS. WordPress is a better choice as compared with other CMS platforms. This survey was conducted using 110 students and asked the participants to compare various CMS on given parameters. The CMS with the most efficient results is WordPress, while Joomla and Drupal are the second and third most preferred CMSs respectively.

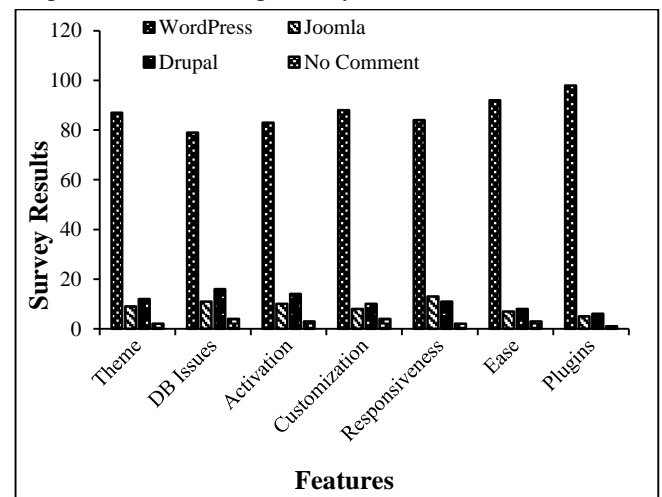


Fig.8. Survey Results

4. CONCLUSIONS

This study focuses more on how we can understand different types of CMS technologies that are mostly used for creating business websites. Through this study, we have discussed and

represented a comparative analysis of three widely used CMS technologies i.e. WordPress, Joomla, and Drupal. The present study will help website developers to decide the right platform for their website development.

To evaluate the performance of the selected CMS technologies, a questionnaire was used among the sample group to record each participant's experience in the CMS technology of their choice. The finding of the study indicates that a great majority is using WordPress for creating, storing, and presenting their contents on the web. The use of WordPress would allow rapid web application development by computer users to achieve their business goals. However, Joomla and Drupal each have some features, which make them interactive and popular too.

Finally, one of the future research areas is to apply WordPress blog for student's assessment. This study would be very beneficial for faculty in evaluating students work involving web development. Moreover, through the design and implementation of appropriate plugins, we can also analyze the students' progress through online evaluation.

REFERENCES

- [1] A.G. Money and A. Harry, "Video Summarisation: A Conceptual Framework and Survey of the State of the Art", *Journal of Visual Communication and Image Representation*, Vol. 19, No. 2, pp. 121-143, 2008.
- [2] J. Mishra and K.R. Naik, "Quantitative Evaluation of Web2.0 Application. In Application Development and Design: Concepts, Methodologies, Tools, and Applications", pp. 1174-1203, 2018.
- [3] N.A.H.N. Amin, M.N. Almunawar, A.S. Hasnan and N.N. Besar, "Preferences, Benefits, and Barriers of Web 2.0 Tools for Knowledge Sharing in Brunei Darussalam's Tertiary Education", *Proceedings of International Conference on Management Strategies and Technology Fluidity in the Asian Business Sector*, pp. 253-276, 2018.
- [4] T. San, T.T. Han, W.M. Thuzar and N.N. Hlaing, "Study on Content Management System: WordPress, Joomla, Drupal", *International Journal of Research*, Vol. 6, No. 9, pp. 301-303, 2019.
- [5] A.M. Skulimowski and I. Badecka, "Competition Boosts Innovativeness: The Case of CMS Evolution", *Proceedings of International Conference on Knowledge, Information, and Creativity Support Systems*, pp. 188-204, 2015.
- [6] P. Blazek, K. Kuca, J. Krenek and O. Krejcar, "Comparative Evaluation of Open Source Laboratory Information and Management Systems", *Proceedings of International Conference on Open Systems*, pp. 19-24, 2018.
- [7] Sharon Q. Yang, "*Emerging Technologies for Librarians: A Practical Approach to Innovation*", Elsevier, 2016.
- [8] J. Lockett, M. Swan and K. Unal, "The Agile Systems Framework: Enterprise Content Management Case in Disciplinary Convergence in Systems Engineering Research", *Proceedings of International Conference on Electrical Engineering and Informatics*, pp. 1-6, 2018.
- [9] N. Bandirmali, "MTCMF: A Novel Memory Table-Based Content Management Framework for Automatic Website Generation", *Computer Standards and Interfaces*, Vol. 58, pp. 43-52, 2018.
- [10] Aakanksha Mirdha, Apurva Jain and Kunal Shah, "Comparative Analysis of Open Source Content Management Systems", *Proceedings of IEEE International Conference on Computational Intelligence and Computing Research*, pp. 1-8, 2014.
- [11] S.P. Adithela, M. Christie, S. Marru and M. Pierce, "Django Content Management System Evaluation and Integration with Apache Airavata", *Proceedings of International Conference on Practice and Experience on Advanced Research Computing*, pp. 86-94, 2018.
- [12] Top 10 Popular CMS by Market Share (to Start a Website), Available at: <https://www.isitwp.com/popular-cms-market-share/>, Accessed on 2020.
- [13] Carlos J. Costa, Manuela Aparicio Joao and Paulo Figueiredo, "Patient Health Portal: User Calendar Perspective", *Procedia Technology*, Vol. 5, pp. 849-858, 2012.
- [14] Kamran Rasheed, Muhammad Noman, Muhammad Imran, Muhammad Iqbal, Zujaj Misbah Khan and Malik Muneeb Abid, "Performance Comparison among Local and Foreign Universities Websites Using SEO Tools", *ICTACT Journal on Soft Computing*, Vol. 8, No. 2, pp. 1597-1610, 2018.