

## A STUDY TO FIND THE ASSOCIATION BETWEEN TECHNOLOGY PLATFORMS AND EDUCATIONAL SOFTWARE DEVELOPMENT COSTS

**Dr. Shubhangi Potdar<sup>1</sup>, Dr. Mahesh Potdar<sup>2</sup>, Dr. Sulakshana Vispute<sup>3</sup>**

<sup>1</sup>Assistant Professor, MCA Department, IBMRD, Ahmednagar, SPPU, Pune, India

<sup>2</sup>Associate Professor, MCA Department, IMSCD & R, Ahmednagar, SPPU, Pune, India

<sup>3</sup>Assistant Professor, MCA Department, NMITD, Mumbai University, India

<sup>1</sup>shubhangipotdar@rediffmail.com, <sup>2</sup>maheshpotdar@rediffmail.com and <sup>3</sup>suluvispute@gmail.com

### ABSTRACT

*The information and Communication Technology (ICT) has changed rapidly over the past two decades. Internet and related technology changed the communication and learning habits of society and Most software developers don't use a specific development approach and aren't aware how to incorporate the appropriate measurements into the process to enhance and decrease defect, time, and rework in the lifecycle.*

*CMSs and other open frameworks deal with the creation, storage, modification, retrieval and display of data or content. In this paper, researcher conducts a literature review to study such technologies that can reduce the educational software development costs by reducing development time, efforts, resources etc. Researcher also collects the primary data from 300 respondents from software development field and by using Chi-Square Test tried to find whether there is any association between technology platforms (Web Technologies and Frameworks) used for software development and Costing (Cheaper and Expensive).*

*Keywords: Framework, Content Management System, Drupal, Joomla and WordPress, Web Content Management*

### 1. INTRODUCTION

We are in the information age and it is very important to store and retrieve information in the most convenient way. Information can be organized by hosting the website. The problem faced by institutions is to keep their website content up to date. The internet offers a range of options for presenting information. Documents are available in different forms such as XML, HTML and text documents. Multimedia data such as audio data mp3 and image such as jpg, gif and video data MPEG also plays a vital role in libraries. Lot of documents is in different formats and is published online by different group of people. Content management systems were created to precisely help support this complex task. Without much of technical knowledge Content Management systems like Drupal, allows in creating and managing website easily.[10] CMS (Content Management System) is a computer program that allows users to create, organize, and alter digital content without requiring specialist technical skills.

### EDUCATIONAL SOFTWARE

Now a days it is mandatory for each of the educational institutions to have their website, along with this website to match with this digital era institution has other software such as library management system , Digital Library, Leave Management System , Online Examination System, Online Admission System, Office administration system etc.

### 2. WHAT IS CMS?

HTML, CSS, PHP, ASP, JavaScript, and other languages are used to create web applications. Each language has its own set of characteristics that can lead to a variety of issues and restrictions, such as unacceptable code, a higher chance of loss of data, and difficulty updating, all of which can raise development and maintenance costs. In order to satisfy the changing problems and requirements in the software development business, several platforms for software development are being introduced.

For every organisation, institution, or even a person, content is perhaps the most valuable and helpful asset, but maintaining the correct content in the right form is tough. In today's digital world, the majority of information seekers rely heavily on the internet for digital content, resulting in a demand for content production, development, and organisation. The CMS can be used to create social networking websites, portfolios, forums, static websites, ecommerce websites, and blogs, among other things. There are several different content management systems, each with its own set of functionality. A content management system (CMS) enables anyone with little or no technical skills to create, change, update, and publish webpage content. [12]

A CMS system's functionality vary, but they typically include web-based publication, format management, revision control, indexing, searching, and retrieval [12]. Enterprise content management (ECM) and website content management are two common uses for CMS (WCM). CMS is primarily used to lower the cost of data administration.

### 3. CONTENT MANAGEMENT SOFTWARE USEFUL IN EDUCATIONAL SOFTWARE DEVELOPMENT:

- i) **Drupal:** Drupal is the most well-known open source CMS, having been created by Dries Buytaert in 1999. Drupal is a free programme that enables an individual or a large community to effortlessly publish, manage, and organize a wide range of material on a website with an almost limitless number of customization options. Drupal.org is an open source web platform that has been developed and distributed. The Drupal features module supports content management systems, collaborative authoring platforms, forums, newsletters, file uploads, and a variety of other features.[10]
- ii) **Joomla:** Joomla is a content management system (CMS) for creating web content that is free and open-source. It's based on the model-view-controller web application framework, which can be utilized without the CMS. Joomla is based in PHP, using object-oriented programming (OOP) tools and algorithms design patterns, and contains capabilities such as page caching, RSS feeds, printable copies of pages, newsfeed flashes, blogs, polls, search, and language internationalization support. [4]
- iii) **Word Press:** WordPress is a PHP-based content management system (CMS) that works with either a MySQL or MariaDB database. A modular architecture and a template system, referred to as Themes in WordPress, are among the features. WordPress began as a blog-publishing platform, but it has now expanded to include more traditional mailing lists and forums, as well as library collections, membership sites, learning management systems (LMS), and online commerce. [3]
- iv) **Plone:** Plone is a content management system (CMS) based on the Zope application server that is free and open source. Plone is marketed as an enterprise content management system (CMS) that is often used for intranets and as component of a company's web presence. The US Federal Bureau of Investigation, the Brazilian Government, the United Nations, the City of Bern (Switzerland), the New South Wales Government (Australia), and the European Environment Agency are among the high-profile public sector users. Plone's proponents point to the platform's safety track record and ease of use as reasons to use it.[8]
- v) **Expression Engine:** Expression Engine, also known as "EE," is a number of co content management system created by Ellis Lab, an American software business. It's a flexible web platform with three license levels: Freelancing, Non-Commercial, and Commercial. [11]

We can use these Content management software to develop educational software to reduce development time, effort, resources i.e. indirectly the software development cost.

#### Use of CMS to Develop Academic Library in Educational Field:

The library is the king's palace, and the librarian is the governor who regulates and governs content management. Content is detailed information in the virtual environment at hybridized library movement in digital world, and it can include text, graphics, photographs, sounds, movies, and data, among other things. The greater problem for librarians and information scientists is managing this granular data in a dynamic digital context. The ancient adage "garbage in, trash out" applies to traditional content management technologies. The content management system is how content is managed throughout the whole content management life cycle, from production to dissemination. It is a tool that allows a wide range of technical and non-technical company employees to create, edit, manage, and finally publicly release a range of content (like as text, graphics, video, and documents, among other things) while adhering to a centralized set of rules, processes, and workflows that focus on ensuring coherent, electronic content. When it comes to implementing a content management system in a library, a content management strategy is required. Martin White's book "The Content Management Handbook" outlines the aspects of content management strategy as a road map for framing the strategy. [11]

Drupal is a robust Content Management System (CMS) that is well-suited to meeting the needs of a scholar in any university or institute with relative ease and little complication. In many libraries, software engineers do this task, while librarians assist with data collection and organization. However, in order to create effective as well as efficient Libraries portal, library professionals should be involved from the beginning of content planning to the end of hosting it on a server. This not only allows us to learn the ins and outs of such library portal, but it also allows us to obtain the capacity to apply ICT to academic libraries on our own, which is extremely important in this day and age. [5]

When using joomla CMS, library personnel do not need to have advanced IT abilities. It has a lot of highly specialized features, and it required some technical assistance in this situation, such as MYSQL backups, local host installation folders, and PHP coding. The authors also proposed that librarians should continuously update their offerings on joomla websites.

In libraries and information centers, online content management is a relatively new notion. Every company now tries to keep a website up to date, whether for intranet or the Internet. The majority of public and private university libraries utilized drupal WCMS 9 (36.0 percent) and customized 9 (36.0 percent), followed by joomla 4 (16.0 percent), and word press 3

(36.0 percent) (12.0 percent ). In some nations, libraries do not have enough IT experts to manage their CMS; for example, just 11 (44.0 percent) libraries have an IT specialist, while the remaining 14 (56.0 percent) libraries do not. Libraries in such regions of the world should benefit from a web content management system, as well as IT-skilled librarians to manage web content and update their websites on a regular basis. In developing countries, library authorities must be trained and educated on how to use a web content management system to market themselves and their libraries, and employees should indeed be trained and educated on how to use a web content management system to market themselves and their libraries. [12]

CMS provides for the management of all components of a website, making web creation highly adaptable and easier to deploy. CMS had already allows developers to launch websites much more quickly, whereas making a website have used available web technologies takes a long time. The majority of CMSs are search engine optimized, so users don't have to bother about optimizing their websites for Google page rankings. [9].

#### 4. RESEARCH DESIGN

##### OBJECTIVE OF THIS RESEARCH IS:

- To identify the **extent of cost parameters** that involved in educational software development.

##### HYPOTHESIS

A literature review was conducted in order to formulate a hypothesis. Earlier scientific findings were also examined, and specialists' assistance was sought. The hypothesis was then written down as follows:

**H1:** There is no association between technology platforms and Costing.

The research design is as follows

##### TYPES OF DATA:

This study uses a combination of primary and secondary data. The core information was gathered from 300 software developers. Questionnaires are used to acquire main information. The total number of questionnaires in the sample is 300. Purposive Sampling was utilized by the researcher in this case: One of the most prevalent sampling procedures, purposeful sampling, divides participants into groups based on pre-determined factors relevant to a specific research issue. Sample sizes are determined by the time and resources available, as well as the study's objectives, and may or may not be fixed data gathering procedures.

To test the questionnaire, a pilot survey of 25 people was conducted. The pilot survey's problems were corrected, and the final version of the questionnaire was written.

The questionnaire drafted for Software Development Organizations consists of 16 questions. From these 16 questions 2 important questions for this research are as given below

1. **From the following which are the Web technologies that can affect (makes cheaper or expensive) the estimated cost of educational software (by affecting its development time, effort, resource, size etc.)?**

Sr. No	Web Technologies	Cheaper	Expensive
1.	Word press		
2.	Joomla		
3.	Drupal		
4.	Moodle		
5.	Plone		

2. **From the following which are the Frameworks that can affect (makes cheaper or expensive) the estimated cost of educational software (by affecting its development time, effort, resource, size etc.)?**

Sr. No.	Frameworks	Cheaper	Expensive
1.	Scrum		
2.	Agile System Development		
3.	Ruby on rails		

The acquired data was first categorized, and then displayed in tables; in reality, classification and tabulation go hand in hand. As a result, tabulation is based on categorization. Because tabulation places categorized data in rows and columns, it is a mechanistic function of classification. Tabulation is the act of presenting data in an appropriate format, whereas classification is the process of statistical analysis.

##### Graphical / Diagrammatic Representation of Data:

MS-Excel, SPSS, and other tools are used to evaluate the data acquired from original data. The results of the analysis are provided in two ways:

- a) Graphical Presentation

b) Quantification

**5. ANALYSIS OF RESPONSE:**

**6.1. Web Technologies that Can Be Used to Reduce the Estimated Cost of Educational Software**

There are various web technologies that can reduce the development time, efforts, resource and many more which can directly affect on estimated cost. Data collected to find the awareness of respondents about such technologies that can be use to reduce the estimated cost of educational software is presented in TABLE1

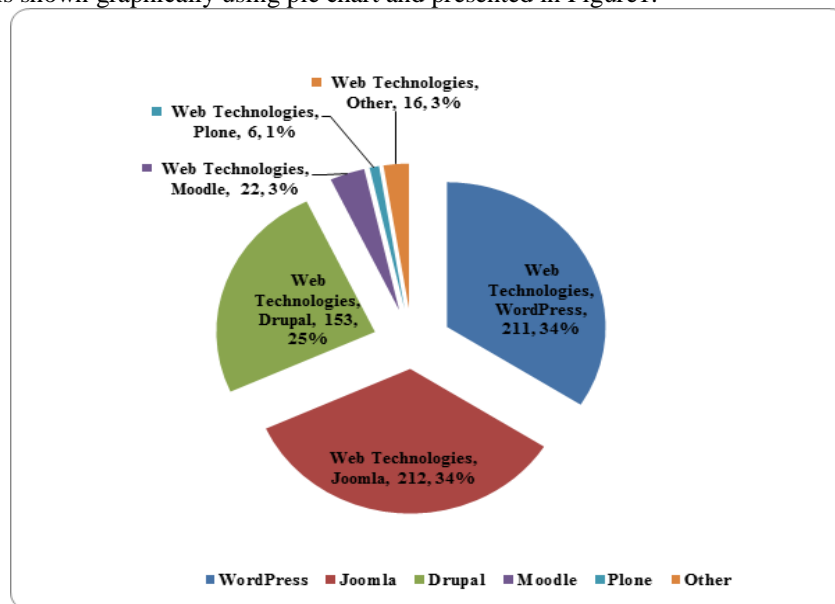
Web Technologies	No. of Responses		Percent of Cases
	Responses	Percent	
WordPress	211	34.0%	70.3%
Joomla	212	34.2%	70.7%
Drupal	153	24.7%	51.0%
Moodle	22	3.5%	7.3%
Plone	6	1.0%	2.0%
Other	16	2.6%	5.3%
<b>Total</b>	<b>620</b>	<b>100.0%</b>	<b>206.7%</b>

**Table.1.** Web technologies that can be used to reduce the estimated cost of educational software

Table.1 shows that 70.7 percent of respondents believe Joomla can help decrease the cost of development of educational software, 70.3 percent believe WordPress can actually decrease the cost of development of educational software, 51.0 percent believe Drupal can minimize the development cost, and very few believe other technological advances can start reducing the development cost.

JQuery, Visual Design, MVC, Windows Azure, and .NET were also highlighted by some responders as ways to cut costs. This analysis is highly important to this study since it reveals that Joomla, WordPress, and Drupal are web technologies that can minimize the cost of development of educational software, which is one of the research's objectives.

The data in table 1 is shown graphically using pie chart and presented in Figure1.



**Figure1:** Web Technologies

**6.2. Standard Frameworks And Libraries That We Can Be Used To Reduce The Estimated Cost For Software Project**

There are various Standard Frameworks and Libraries that can reduce the development time, efforts, resource and many more which can directly affect on estimated cost.

TABLE 2 shows the data received from respondents in order to identify Standard Frameworks and Libraries that can be used to lower the anticipated cost of educational software.

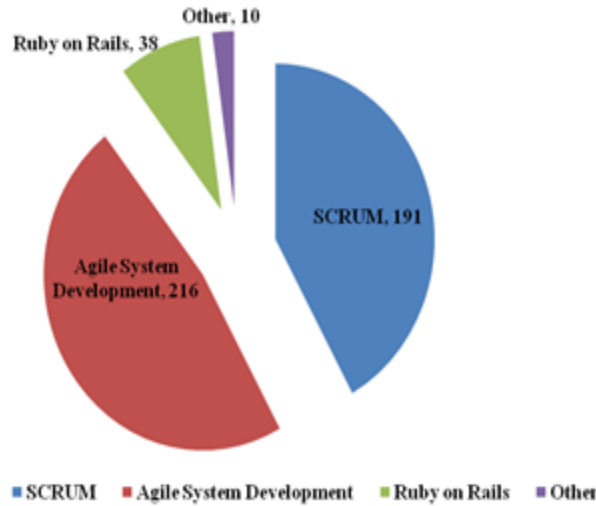
Standard Frameworks and	No. of Responses	Percent of Cases
-------------------------	------------------	------------------

Libraries	Responses	Percent	
SCRUM	191	42.0%	63.7%
Agile System Development	216	47.5%	72.0%
Ruby on Rails	38	8.4%	12.7%
Other	10	2.2%	3.3%
<b>Total</b>	<b>455</b>	<b>100.0%</b>	<b>151.7%</b>

**Table.2.** Standard Frameworks and Libraries that we can be use to reduce the estimated cost for software project **Table.2** shows that 72.0 percent of respondents believe Agile System Development can lower the cost of developing educational software; 63.7 percent believe SCRUM can lower the cost of developing educational software; and 12.7 percent believe Ruby on Rails can lower the cost of developing educational software. Some respondents also said that framework and open - sourced technologies, such as Codeigniter and Windows Azure, can help minimise development costs, while one respondent added that most educational software is robust in nature, thus agile technique is not required most of the time. If projects are complex and having several recursive changes needed then the agile system can be helpful to reduce development costs as are open sources too.

According to the objective of this research, which is to identify the ways to reduce the development cost of educational software, this analysis is very important in this research because it shows that Agile System Development, SCRUM and Ruby on Rails can reduce the development cost of educational software.

The data in **Table.2** is shown graphically using Pie Chart and presented in Figure2.



**Fig.2:** Standard Frameworks and Libraries

## 6. HYPOTHESIS TESTING

Chi square test for independence of attributes:

The Chi-Square test on independence is used to see if 2 independent (categorical) variables have a significant relationship. One nominal variable's frequency is compared to distinct values of the second nominal variable. An R\*C contingency table, in which R is just the row and C is just the column, can be used to present the data.

**Hypothesis - There is no association between technology platforms (Web Technologies and Frameworks) and Costing (Cheaper and Expensive).**

**Chi-Square Test**

**Frequencies**

	Observed N	Expected N	Residual
Cheaper	179	150.0	29.0
Expensive	121	150.0	-29.0
Total	300		

**Table 3.** Web Technology

	Observed N	Expected N	Residual
0	152	150.0	2.0
1	148	150.0	-2.0
Total	300		

**Table 4.** Frameworks

	web technology	frameworks
Chi-Square	11.213 <sup>a</sup>	.053 <sup>a</sup>
Degrees of freedom	1	1
Asymp. Sig.	.001	.817

**Table 5.** Test Statistics

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 150.0.

At 1 degree of freedom, the chi square value of 11.21 (Degrees - of - freedom =1, N=300), value of significance of 0.001 (p 0.05), is significant, indicating that the expected and actual frequencies differ significantly. As a result, the premise that there is no relationship between technological platforms (Web Technologies) and cost can be dismissed (Cheaper and Expensive). As a result, technology platforms (Web Technologies) and cost are linked (Cheaper and Expensive)

At 1 degree of freedom, the chi - square test value of 0.053 (Degree of freedom =1, N=300), value of significance of 0.81 (p> 0.05), is not significant, indicating that there is no significant difference between the expected and observed frequencies. As a result, we can't rule out the possibility that technology platforms (frameworks) and costing are unrelated (Cheaper and Expensive). As a result, there is no link between costing and technology platforms (frameworks) (Cheaper and Expensive)

## 7. CONCLUSION

This analysis in this research reveals that Agile System Development, SCRUM, and Ruby on Rails can minimize the cost of development of educational software, which is in line with the research's goal of identifying solutions to minimize the cost of development of educational software. The Chi-Square Test, which was used to analyses the data, revealed that there is a link between software platforms (Web Technologies) and costing (lower and higher), but that there is no link between software platforms (frameworks) and costing (Cheaper and Expensive). Some respondents responded that they are unaware of new frameworks for application development and that training is required. Frameworks and open - source software technologies, as well as Codeigniter and Windows Azure, were highlighted by some respondents as ways to cut software development costs. It demonstrates that technological platforms (Web Applications and Frameworks) and cost are linked (Cheaper and Expensive).

## REFERENCES

- [1] Adrian Runceanu, M. P. (2013). HOW TO BUILD, DEVELOP AND MAINTAIN AN EDUCATIONAL WEBSITE USING AN OPEN SOURCE FRAMEWORK. Annals of the „Constantin Brancusi” University of Targu Jiu, Engineering Series , No. 3/2013 , 198-205.
- [2] Black, E. L. (n.d.). Selecting a Web Content Management System for an Academic Library Website. 185-189.
- [3] Copperboom. ( 2004, April 19). WordPress. Retrieved February 10, 2021, from <https://en.wikipedia.org/wiki/WordPress>
- [4] Dhirendra Sharma, R. S. (2009). Web Content Management in Universities Using Joomla!: Freedom All Together. 7th International CALIBER-2009, , 253-266.
- [5] Dr. Avineni Kishore, O. S. (n.d.). DRUPAL: DEVELOPING LIBRARY PORTAL USING OPEN SOURCE CONTENT MANAGEMENT SYSTEM.
- [6] Faudziah Ahmad, F. B. (2011). INVESTIGATING THE AWARENESS OF APPLYING THE IMPORTANT WEB APPLICATION DEVELOPMENT AND MEASUREMENT PRACTICES IN SMALL SOFTWARE FIRMS. International Journal of Computer Science & Information Technology (IJCSIT) Vol 3, No 6, Dec 2011 , 147-158.
- [7] M R Rawtani, S. S. (2009). Drupal: The Open Source Content Management System Software Suit For Library With Library 2.0 Features. 7th International CALIBER 2009 , 176-183.
- [8] Plone (software). ( 2022, January 1). Retrieved February 18, 2022, from [https://en.wikipedia.org/wiki/Plone\\_\(software\)](https://en.wikipedia.org/wiki/Plone_(software))
- [9] Rohan Hooda, M. G. (April 2015). A Survey on Content Management System. International Journal of Advance Research in Computer Science and Management Studies, Vol. 3, Issue 4 , 291-295.
- [10] S.Satish. (n.d.). Content Management Software – Drupal : Open Source Software to create library website. 1-5.
- [11] SHIVAKUMAR.T.C, P. (n.d.). Use and Application of Open Source Content Management Software in Modern Academic Libraries: An Overview.

- [12] Umme Habiba, R. A. (2015). Use of Web Content Management Systems (WCMSs) in Library: A Study of University Libraries in Bangladesh. Research Journal of Library Sciences Vol. 3(6), 1-7, July (2015) \_ISSN 2320–8929 , 1-7.