

WEB CONTENT ACCESSIBILITY GUIDELINES

2.1 COMPLIANCE BY INDIAN OERS: AN EMPIRICAL STUDY OF SWAYAM AND E-PG PATHSHALA

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Open Educational Resources (OERs) improves the quality of teaching and learning with the increased availability of quality, relevant, less costly learning materials (access). This paper describes the accessibility results of two Indian OER initiatives: e-PG Pathshala (ePGP) (OCW) and SWAYAM (SwM) (MOOC) by using TAW accessibility checker. A targeted web-page of the websites is validated for errors, warnings and not reviewed under AAA conformance level of WCAG 2.1 guidelines. The outcomes are tabulated beginning with POUR (Perceivable, Operable, Understandable & Robust) principle following their guidelines where the accessibility of ePGP and SwM was compared. The statistical result shows that the overall number of problems appeared in the case of SwM is higher (i.e. 110) than ePGP (i.e. 101). Again, the results of the descriptive statistics revealed Mean =2.806 (ePGP) & 3.056 (SwM). The SD obtained were 3.241 (ePGP) & 4.472 (SwM). The Shapiro-Wilk Test for normality of data revealed non-normal data while the WCAG 2.1 POUR parameters were found to be positively correlated for ePGP and SwM ($r_s = 0.67$, $p < 0.001$).

Keywords: Web accessibility; Open Educational Resources; MOOCs; POUR; WCAG 2.1; ePGPathshala; SWAYAM; INFLIBNET

INTRODUCTION

The quality of knowledge is sharply dependent on the quality and the extent of information available to the user community. The modern age is progressively dominated by the Internet, which facilitates the use and dissemination of information to the diverse population with minimal time. If last 20 years (2000-2019) taken under consideration, the Internet user base has seen a remarkable growth worldwide (e.g. 1157% in world total, 1913% in Asia, and 11100 % in India) (Internet World Stats, 2019). In the case of internet-mediated information dissemination, Open Educational Resources (OER) become relevant among the most popular and useful means of disseminating information to the common people in any area of our society. It is one of such movement which aims to provide the user with an easy define platform where they can access their study material, course note, interactive videos for the learning purpose, free of cost

provided by reputed institutions and academicians. To this end, the accessibility of OER initiatives must be a critical issue when we speak about creating an information-based society in which the widespread distribution of information without prejudice on the part of individuals based on their right to access, read, interpret and comprehend published information tangibly without any struggle through established modes of publishing. The current study try to test and evaluate the accessibility issues that may arise in the websites of OER initiatives in India, specifically focuses on INFLIBNET maintained OpenCourseWare (OCW): ePGPathshala and Massive Open Online Courses (MOOCs): SWAYAM with the help of web accessibility checker tool TAW using WCAG 2.1 guidelines as a standard.

STUDY BACKGROUND

“Open Educational Resources (OER) are teaching, learning and research materials in any medium – digital or otherwise – that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions” (UNESCO, 2017). Two broad categories of OER are OCW and MOOCs. David Wiley is one of the pioneers of OER suggested (Hilton et al., 2010) that there are five core principles of open publishing:

- a) **Retain** - the right to make, own, and control copies of the content (e.g., download, duplicate, store, and manage)
- b) **Reuse** - the right to use the content in a wide range of ways (e.g., in a class, in a study group, on a website, in a video)

- c) **Revise** - the right to adapt, adjust, modify, or alter the content itself (e.g., translate the content into another language)
- d) **Remix** - the right to combine the original or revised content with other material to create something new (e.g., incorporate the content into a mashup)
- e) **Redistribute** - the right to share copies of the original content, your revisions, or your remixes with others (e.g., give a copy of the content to a friend)

In another side, the Ljubljana OER action plan (OER Congress, 2017) provides recommendations to stakeholders in five strategic areas:

1. Building the capacity of users to find, re-use, create and share OER
2. Language & Cultural issues
3. Ensuring inclusive and equitable access to quality OER
4. Developing sustainability models
5. Developing supportive policy environments.

REVIEW OF LITERATURE

To understand the importance of web accessibility and to create awareness here some prominent scholarly researches are discussed. It also correlates the present study among existing literature and visualizes its need for equal access to information. Csontos and Heckl (2020) developed a website assessment method by comparing GTmetrix and WAVE accessibility checking tool where 23 Hungarian websites of

public sector bodies were taken as study sample. Panda and Chakravarty (2020) investigated and identified the status of WCAG conformance levels and accessibility status in terms of Severity (Error, Warning and Review) and Responsibility (Editor, Webmaster and Developer) of Indian Institutes of Technology (IIT) Library websites based on Siteimprove Software-as-a-Service (SaaS) platform. Angkananon, Wald and Ploadaksorn (2020) in their paper dealt with the accessibility evaluations of Thailand's web using WebThai2Access, which was developed from Web2Access with Thai Evaluation Criteria for the Thai guidelines and evaluation tools to be used to evaluate Thai websites for those with disabilities. The main objective of the study of Jeba et al. (2019) is to find out the usability and accessibility including broken links of the public sector and government websites (N=140) of Bangladesh by different online tools; usability and accessibility were tested by Web Site Optimization Tool, IDI Web Accessibility Checker along with 2bone Link Checker respectively.

There are also some older studies, like, Ismail and Kuppusamy (2016) provided insights into the current state of web accessibility in 40 websites of North East Region of India by adapting web accessibility evaluation tools namely EvalAccess and WAVE, where the study result emphasized the need for enhancing the accessibility of these websites further. Noh et al. (2015) in their study examined the actual situation of the compliance by conducting web accessibility assessment among 25 websites of the Korean public institutions in the science and technology field according to WCAG 2.0 web

accessibility tool. Adepoju and Shehu (2014) conducted research to evaluate know the usability level via accessibility evaluation of the federal universities in Nigeria using Web Accessibility checker, HERA and WAVE as automated accessibility checking tool according to WCAG (1.0 & 2.0) and the recommendations for improvement on the websites were also included. Al-Khalifa (2012) used the WAVE checker toolbar alongside the manual evaluation of 36 Saudi Arabian e-government websites to detect the most common accessibility errors. Bakhsh and Mehmood (2012) evaluated the websites of the central government in Pakistan including all ministries and divisions using Functional accessibility evaluator and Total validator accessibility evaluation tools based on World Wide Web Consortium's (W3C) web accessibility standards. Abdul Aziz, Wan Mohd Isa, and Nordin (2010) studied the accessibility and usability level of Malaysia Higher Education Website using 120 samples of higher education institution websites from the online portal of the Ministry of Higher Education according to WCAG 1.0 guideline with the help of EvalAccess 2.0 accessibility checker tool. Shah and Shakya (2007) aimed to evaluate the accessibility of 27 central government websites of the government of Nepal using web-based analysis tool called Bobby, developed by the Center for Applied Special Technology (CAST). The present study is a further extension of the previous works, attempting to compare the current state of web accessibility compliance of the selected webpage of two Indian OER initiatives: *ePGP* and *SwM* with the help of *TAW Accessibility Checker* as outlined by WCAG 2.1 guidelines.

SCOPE OF THE STUDY

The National Mission on Education through ICT (NMEICT), funded by the Ministry of Human Resources Development (MHRD), Government of India is initiated for implementing a proper balance between content generation, research in critical areas relating to imparting of education and connectivity for integrating our knowledge with the latest advancements is being attempted (NMEICT_IITKGP, n.d.). For develop a knowledge-based society and promote free & open learning, create and develop OER initiatives throughout India is a major agenda under this mission. The present study focuses on the web accessibility of two distinctive but correlated categories of OER, viz. e-PG Pathshala as an OCW and SWAYAM as a MOOCs platform. Further the normality and correlation between different variables also checked in this paper.

OBJECTIVES OF THE STUDY

The objectives of the present study are to:

1. measure the quality of Indian OER initiatives (ePGPathshala & SWAYAM) in terms of WCAG 2.1 first principle, i.e., Perceivable (P).
2. measure the quality of Indian OER initiatives in terms of WCAG 2.1 second principle, i.e., Operable (O).
3. measure the quality of Indian OER initiatives in terms of WCAG 2.1 third principle, i.e., Understandable (U).
4. measure the quality of Indian OER initiatives in terms of WCAG 2.1 fourth principle, i.e., Robust (R).

5. compare the WCAG 2.1 compliance levels of ePGPathshala and SWAYAM.
6. determine the correlation among the WCAG 2.1 principles - POUR between the two OER initiatives.

RESEARCH HYPOTHESES

The hypotheses developed to investigate the relationship between the aforementioned variables is:

- H₀** There is no positive correlation among the four WCAG 2.1 Principles (POUR) between ePGPathshala and SWAYAM
- H₁** There is positive correlation among the four WCAG 2.1 Principles (POUR) between ePGPathshala and SWAYAM. (Alternate Hypothesis)

METHODOLOGY

In order to accomplish the above study objectives, the authors have relied on TAW, an automatic on-line tool developed by CTIC Technology Centre to analyse the accessibility of websites. TAW was created with technical reference Web Accessibility Guidelines of W3C (WCAG 2.0-2.1) with the aim to monitor the level of accessibility achieved in the design and development of web pages to access to all persons irrespective of their characteristics (Fundacion CTIC, 2020). It is intended for the end-users for their better accessibility when suffering web, as well as for field professionals like webmasters, developers, web designers etc. TAW accessibility checker was used to test specific web pages of e-PG Pathshala (ePGP) and SWAYAM (SwM) website as a target web-page. For e-PG Pathshala,

Library and Information Science subject (<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=21>) page was selected while for the MOOC SWAYAM, Library Automation and Digitisation online certification course page (https://swayam.gov.in/nd2_nou20_lb01/preview) was chosen. The test was conducted on 2nd November 2020. The Analysis level was AAA while TAW indicated HTML, CSS as technologies used for both these resources. The data obtained by this evaluation were also visualized using spreadsheet software and statistical package for greater insight. A comparison was also drawn pertaining to various WCAG principles and guidelines of the two OER initiatives to measure their adherence. To check the normality and correlation between different variables, Shapiro-Wilk Test and Spearman Correlation Test is done using JASP (V. 0.12.2.0) software.

RESULT ANALYSIS AND DISCUSSION

Comparison Chart (POUR: ePGP vs SwM)

According to WCAG 2.1, for a Perceivable (Principle-1) website, information and user interface components must be presentable to users in ways they can perceive. People must be able to perceive the content on a Web page. When a person cannot perceive the content, the page is not accessible. Content may not be perceivable if there are font related issues or missing text alternatives. Table above reveals that 35 issues were flagged by TAW under Perceivable for the ePGP whereas SwM reported 46 issues under this principle.

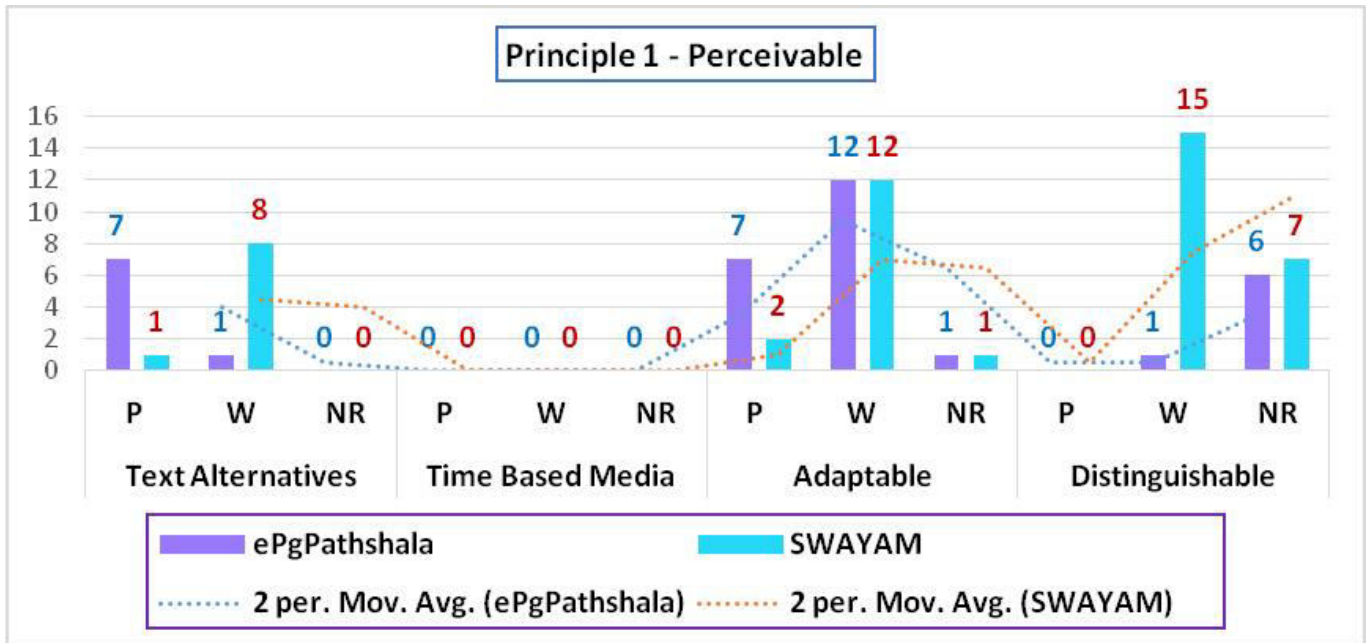
If a Web site has photographs, artwork, drawings, and other graphic elements, adding text alternatives is an easy way to make the site accessible to people with certain disabilities

because some tools used by those people like voice command or a screen reader can only read the text content of the website not an image of a text. In case of Problems regarding Text Alternatives, ePGP was flagged for higher issues than SwM (7:1). However, for Warnings, the situation was reversed (1: 8) meaning lesser warnings for ePGP than SwM. No issues were found to be excluded as untested by TAW. Time-based media is based on a simple premise: a sequence of single frames, when displayed in rapid succession, can give the illusion of movement. As per WCAG 2.1, websites should provide alternatives for time-based media. Again in this guideline, there were no issues found in the target web page of either ePGP or SwM. The Adaptable guidelines encourage us to create content that can be presented in different ways without losing information or structure. Under this guideline, ePGP-SwM ratio was 7:2 while each reporting 12 issues each. One issue each for ePGP and SwM was not reviewed by automated tool TAW. The distinguishable guideline makes it easier for users to see and hear content including separating foreground from background. This guideline detects no problem issues neither in ePGP nor in SwM but 15 Warnings were reported by TAW tool for SwM with ePGP reporting only one. Issues remain undetected were found to be 6 and 7 for ePGP and SwM respectively.

For a website to have Operable user interface components and navigation, visitors must be able to act on it through a keyboard in (Principle-2) instead of a mouse while having enough time to perform tasks. An operable site does not contain information that flashes or flickers (as it may trigger seizures) and is easily navigable without the need for additional assistance.

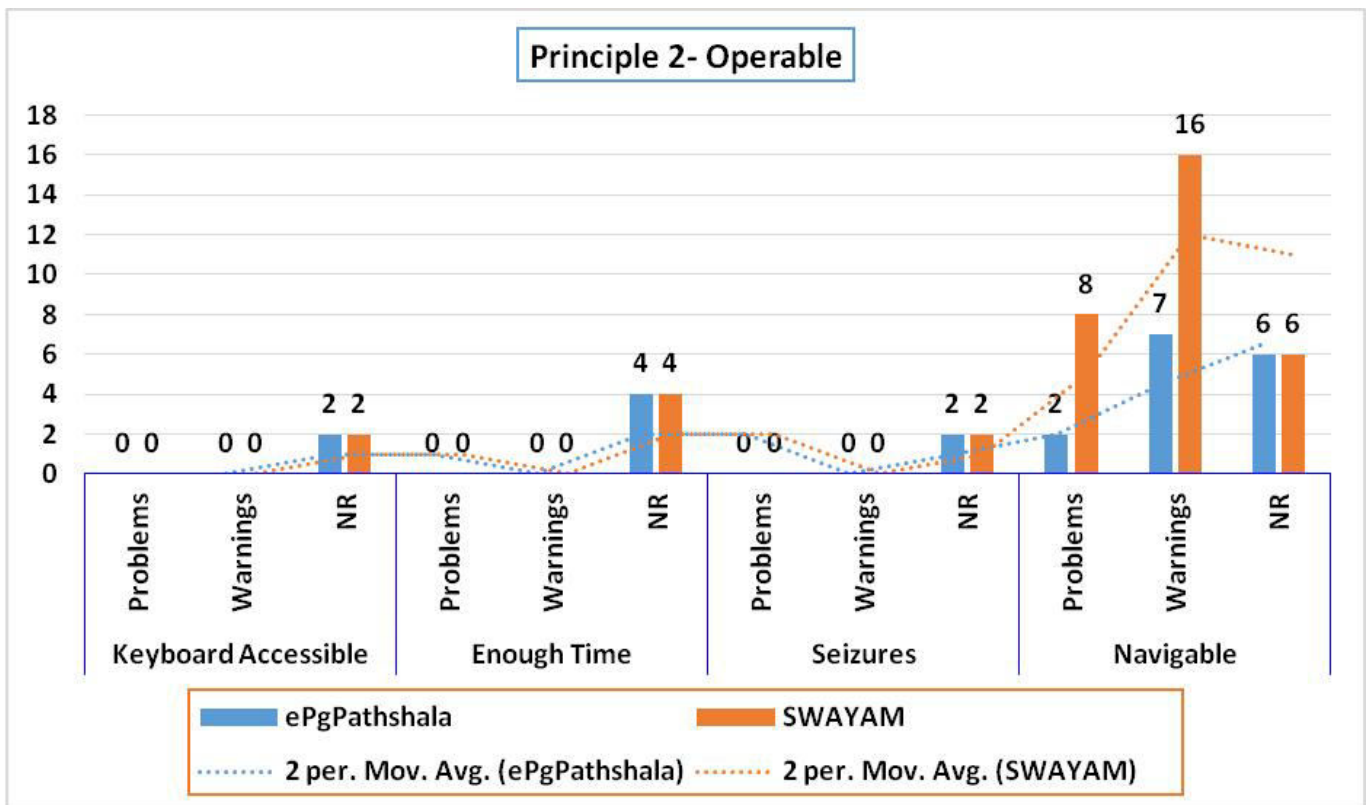
Table 1: Comparison Chart (POUR: ePGP vs SwM)

Accessibility Checker Tool: TAW			OER (Target Websites)		
Standard: WCAG 2.1 Accessibility Guidelines			OCW	MOOC	Total
Principles	Guidelines	Issues	ePGP	SwM	
Perceivable (P)	Text Alternatives	Problems	7	1	8
		Warnings	1	8	9
		NR	0	0	0
	Time Based Media	Problems	0	0	0
		Warnings	0	0	0
		NR	0	0	0
	Adaptable	Problems	7	2	9
		Warnings	12	12	24
		NR	1	1	2
	Distinguishable	Problems	0	0	0
		Warnings	1	15	16
NR		6	7	13	
Total			35	46	81
Operable (O)	Keyboard Accessible	Problems	0	0	0
		Warnings	0	0	0
		NR	2	2	4
	Enough Time	Problems	0	0	0
		Warnings	0	0	0
		NR	4	4	8
	Seizures	Problems	0	0	0
		Warnings	0	0	0
		NR	2	2	4
	Navigable	Problems	2	8	10
		Warnings	7	16	23
NR		6	6	12	
Total			23	38	61
Understandable(U)	Readable	Problems	1	0	1
		Warnings	0	0	0
		NR	6	5	11
	Predictable	Problems	1	0	1
		Warnings	2	5	7
		NR	4	4	8
	Input Assistance	Problems	6	0	6
		Warnings	8	0	8
		NR	0	0	0
Total			28	14	42
Robust (R)	Compatible	Problems	7	1	8
		Warnings	7	10	17
		NR	1	1	2
	Total			15	12
Grand Total			101	110	211



*P- Problems, W- Warnings, NR- Not reviewed

Figure 1: Principle 1 - Perceivable



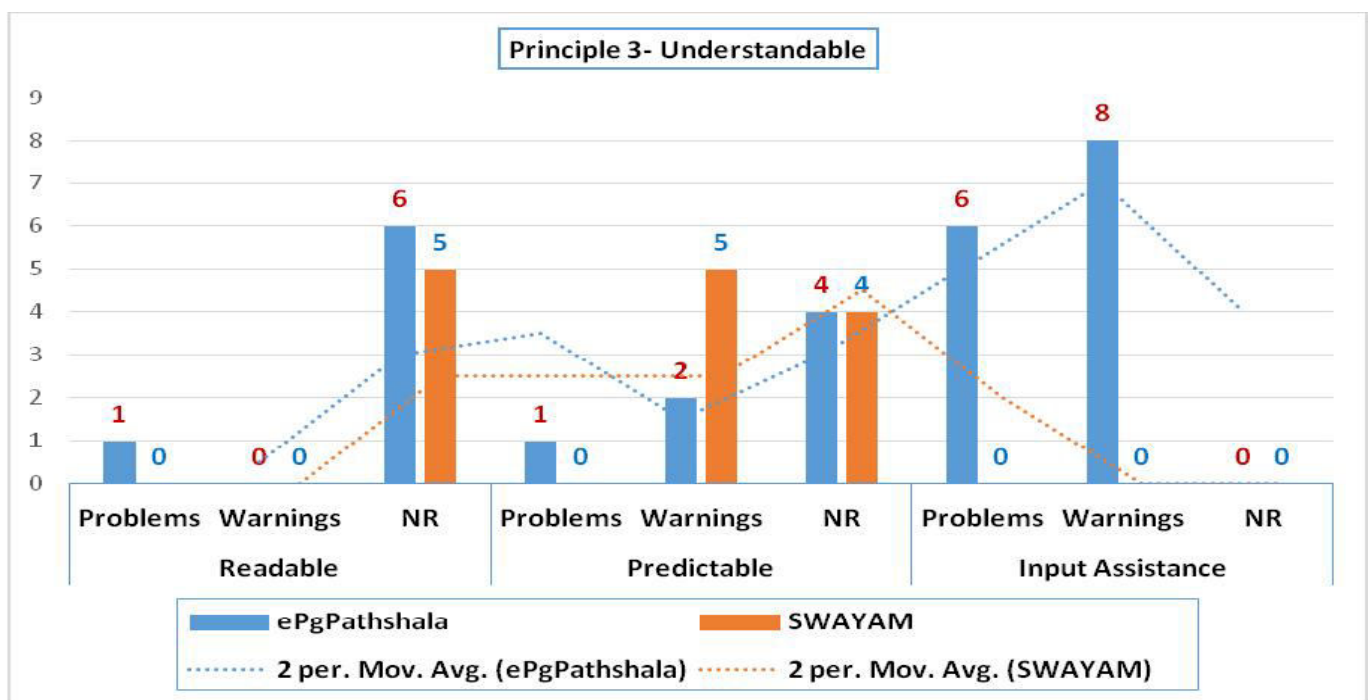
*NR- Not Reviewed

Figure 2: Principle 2- Operable

Keyboard Accessible guideline ensures that in a web page all functionality available from a keyboard (i.e. web pages must be accessible without a mouse). It can be observed that there are no problems or warning issues in the target web-page of ePGP or SwM but issues not-reviewed were 2 each. Enough Time guideline ensures that each web-page gives sufficient time to the end-user to read and use the content. As of Keyboard Accessible, this guideline also reported no problems and warning issues but 4 not-reviewed issues were flagged for both the resources. The navigable guideline provides a way to help the users to navigate, find content and determine where they are. In this guideline ePGP and SwM reported 2 & 8 problem issues; 7 & 16

warning issues respectively with equal not-reviewed issues i.e. 6 for both.

Principle 3 builds on Principles 1 and 2. Conforming to Principle 1 ensures that users can perceive a site. Conforming to Principle 2 ensures that users can act upon a site. But even if visitors can see and interact with content, a site is not fully accessible if they cannot make sense of it. Principle 3 is about increasing the odds that visitors actually understand the content. By following Principle 3 guidelines, visitors will be better able to understand the content. Principle 3 is organized around three ideas reflecting content understandability namely - readable, predictable and input assistance i.e., the site must be designed to help people avoid mistakes; and when they do make mistakes.



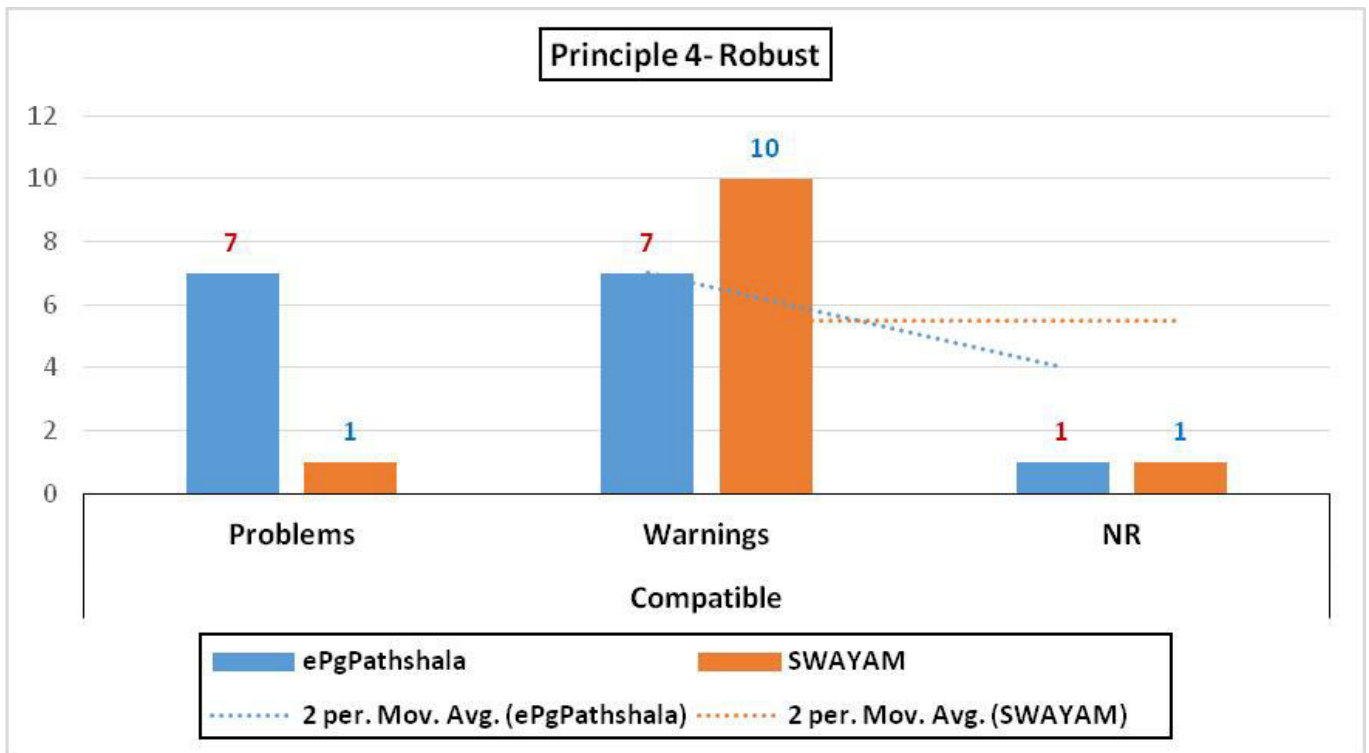
*NR-Not Reviewed

Figure 3: Principle 3- Understandable

Readable guideline means that content can be understood by an educated person, with or without assistive technologies; and that additional information necessary to understand the content is also available. The figure above indicates that there was only 1 problem identified in ePGP but not a single problem was detected in SwM. Again no warning issue was noted in ePGP & SwM with unreviewed issues being 6 and 5 respectively. Predictable is the prior understanding of the orientation of the patterns to content location awareness among the site visitors helping them to focus in on the desired contents. ePGP noted one problem issue, 2 warning issues with 4

unreviewed issues. For SwM, these figures were 0, 5 and 4 respectively. Input Assistance is WCAG 2.1 jargon for techniques that help people avoid mistakes, especially when filling out forms and when they do make mistakes, it refers to the techniques that help people recover from errors. There were 6 problems, 8 warnings and 0 not-reviewed issues noted for ePGP, while SwM reflecting zero values for all these issues under Input assistance.

A Robust (Principle 4) website displays and functions content as the author intends and is compatible with current and future browsers, Web-enabled devices, and assistive technologies.



*NR-Not Reviewed

Figure 4: Principle 4- Robust

Not all users have up-to-date technologies. Compatible web pages also work reasonably well in older and obsolete browsers, web-enabled devices, and assistive technologies. The figure

above indicates that there are 7 problems, 7 warnings and 1 not-reviewed issue concerning ePGP while for SwM, these figures stand at 1, 10 and 1 respectively.

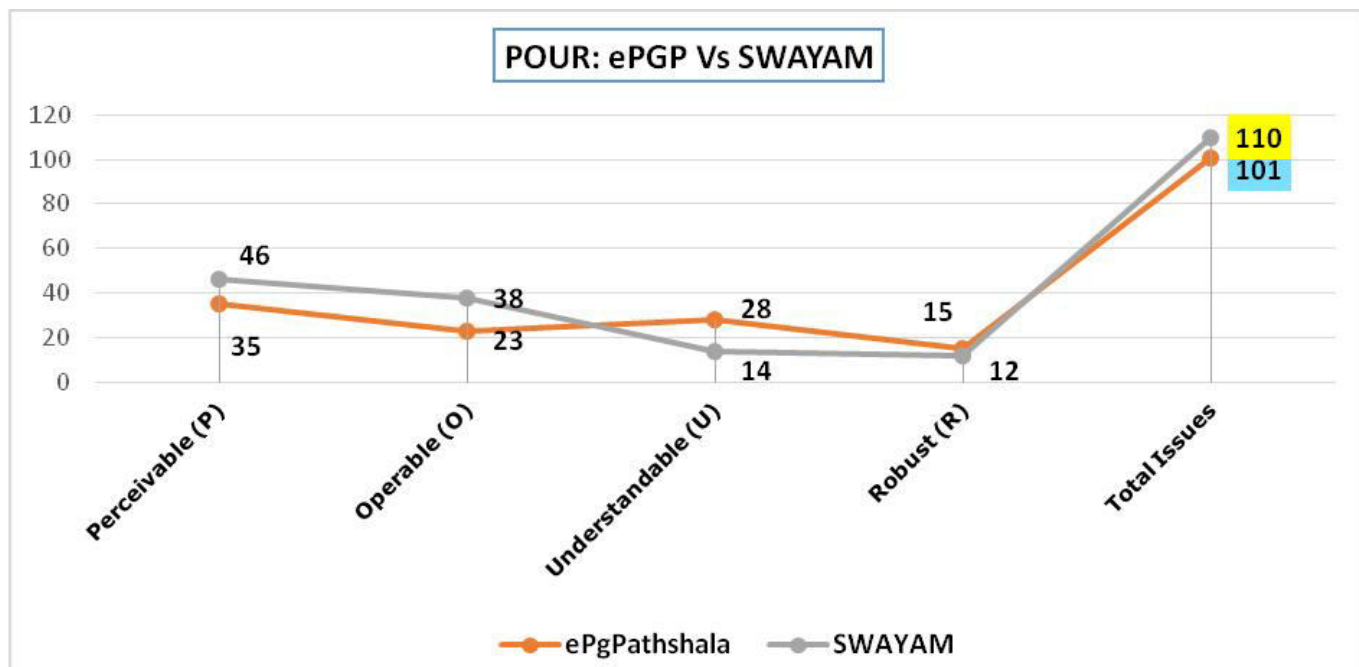


Figure 5: POUR (ePGP vs SwM)

Figure 5 above depicts the overall issues flagged by TAW in the evaluation of target web pages of ePGP and SwM. The result indicates that the total issues pertaining to Perceivable (P), and Operable (O) principle are higher in the case of SwM (i.e. 46 & 38 respectively) than ePGP (i.e. 35 and 23 respectively); though in the case of Understandable (U) and Robust (R) issues ePGP (i.e. 28 & 15 respectively) surpasses SwM (i.e. 14 & 12 respectively). And in Overall, SwM (MOOC) reported higher issues in terms of Problems, Warnings and Not-Reviewed (i.e. 110) than ePGP (OCW) (i.e. 101).

SUMMARY OF FINDINGS

The prior aim of OER is to the dissemination of knowledge & information without any inequality and discrimination. Consequently, the accessibility problems are an important concern in any type of OER and need to be analyzed and improved. In this paper, we analyzed two most popular OER platform viz, e-PGP and SwM with using TAW tool and the findings of the analysis, summarized in Table 2 below, are focused on the principles to which a particular issue pertain.

Table 2: Summary of Findings

Issue Name	Problems				Warnings				Not Reviewed			
OER	ePGP		SwM		ePGP		SwM		ePGP		SwM	
Issues Pertaining to:	I	S	I	S	I	S	I	S	I	S	I	S
■ Perceivable (P)	14	2	3	2	14	3	35	5	7	7	8	7
■ Operable (O)	2	2	8	2	7	3	16	4	14	13	14	13
■ Understandable (U)	8	3	0	0	10	6	5	1	10	10	9	9
■ Robust (R)	7	2	1	1	7	1	10	1	1	1	1	1
Total	31	9	12	5	38	13	66	11	32	31	32	30
WCAG 2.1 Criteria	78 (P=29, O=29, U=17, R=3)											
Suggestions	Corrections are needed				A human review is necessary				Fully manual review			

*I- Issues, S- Success Criteria

In WCAG 2.1 there are all total 78 success criteria, but it is not necessary that a website contains all of these.

■ Perceivable principle has total 29 success criteria and among them,

- in the case of Problem issues 14 issues found in only 2 success criteria in the case of ePGP and 3 issues found in 2 success criteria in SwM.
- in the case of Warning issues 14 issues found in only 3 success criteria in the case of ePGP and 35 issues found in 5 success criteria in SwM.
- in the case of Not Reviewed issues 7 issues found in only 7 success criteria in the case of ePGP and 8 issues found in 7 success criteria in SwM.

■ Operable principle has total 29 success criteria and among the,

- in the case of Problem issues 2 issues found in only 2 success criteria in the case of ePGP and 8 issues found in 2 success criteria in SwM.

- in the case of Warning issues 7 issues found in only 3 success criteria in the case of ePGP and 16 issues found in 4 success criteria in SwM.

in the case of Not Reviewed issues 14 issues found in only 13 success criteria in the case of ePGP and 14 issues found in 13 success criteria in SwM.

■ Understandable principle has total 17 success criteria and among the,

- in the case of Problem issues 8 issues found in only 3 success criteria in the case of ePGP and 0 issues found in SwM.
- in the case of Warning issues 10 issues found in only 6 success criteria in the case of ePGP and 5 issues found in 1 success criteria in SwM.
- in the case of Not Reviewed issues 10 issues found in only 10 success criteria in the case of ePGP and 9 issues found in 9 success criteria in SwM.

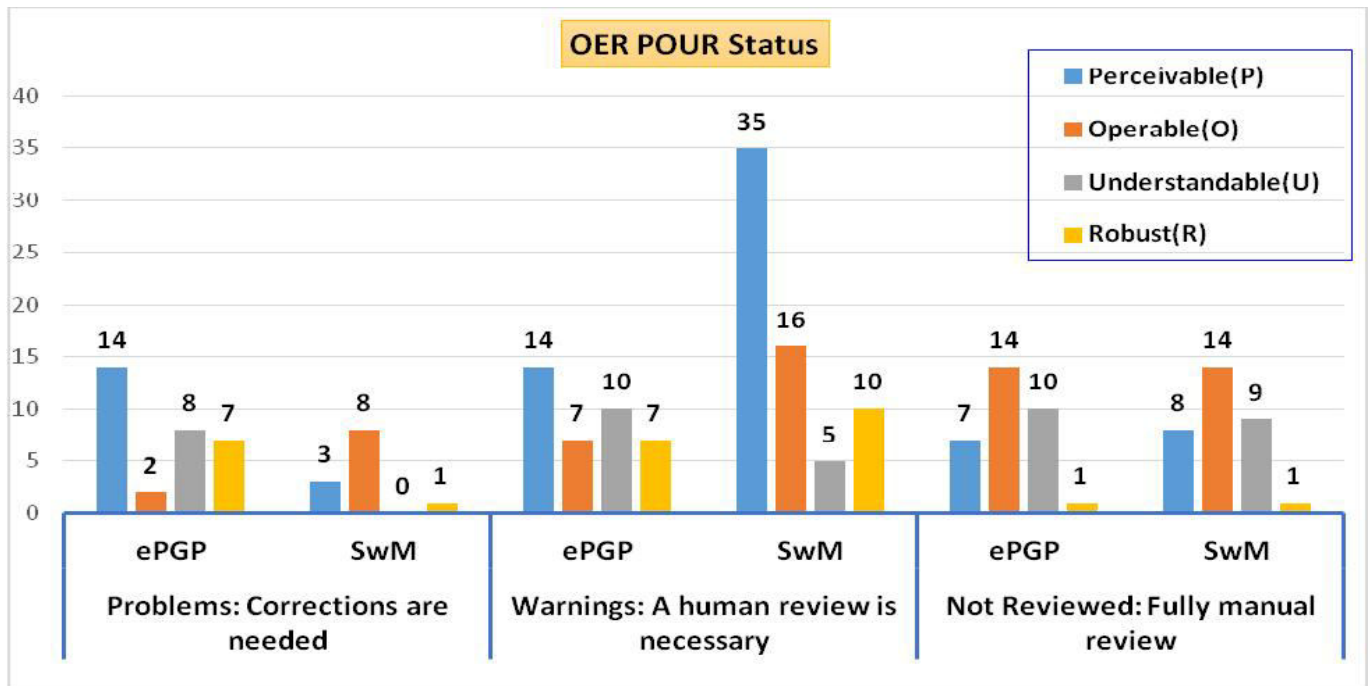


Figure 6: OER POUR Status

■ Robust principle has total 3 success criteria and among the,

- in the case of Problem issues 7 issues found in only 2 success criteria in the case of ePGP and 1 issues found in 1 success criteria in SwM.
- in the case of Warning issues 7 issues found in only 1 success criteria in the case of ePGP and 10 issues found in 1 success criteria in SwM.
- in the case of Not Reviewed issues 1 issues found in only 1 success criteria in the case of ePGP and 1 issues found in 1 success criteria in SwM.
- in the case of Not Reviewed issues 10 issues found in only 10 success criteria in the case of ePGP and 9 issues found in 9 success criteria in SwM.

■ Robust principle has total 3 success criteria and among the,

- in the case of Problem issues 7 issues found in only 2 success criteria in the case of ePGP and 1 issues found in 1 success criteria in SwM.
- in the case of Warning issues 7 issues found in only 1 success criteria in the case of ePGP and 10 issues found in 1 success criteria in SwM.
- in the case of Not Reviewed issues 1 issues found in only 1 success criteria in the case of ePGP and 1 issues found in 1 success criteria in SwM.

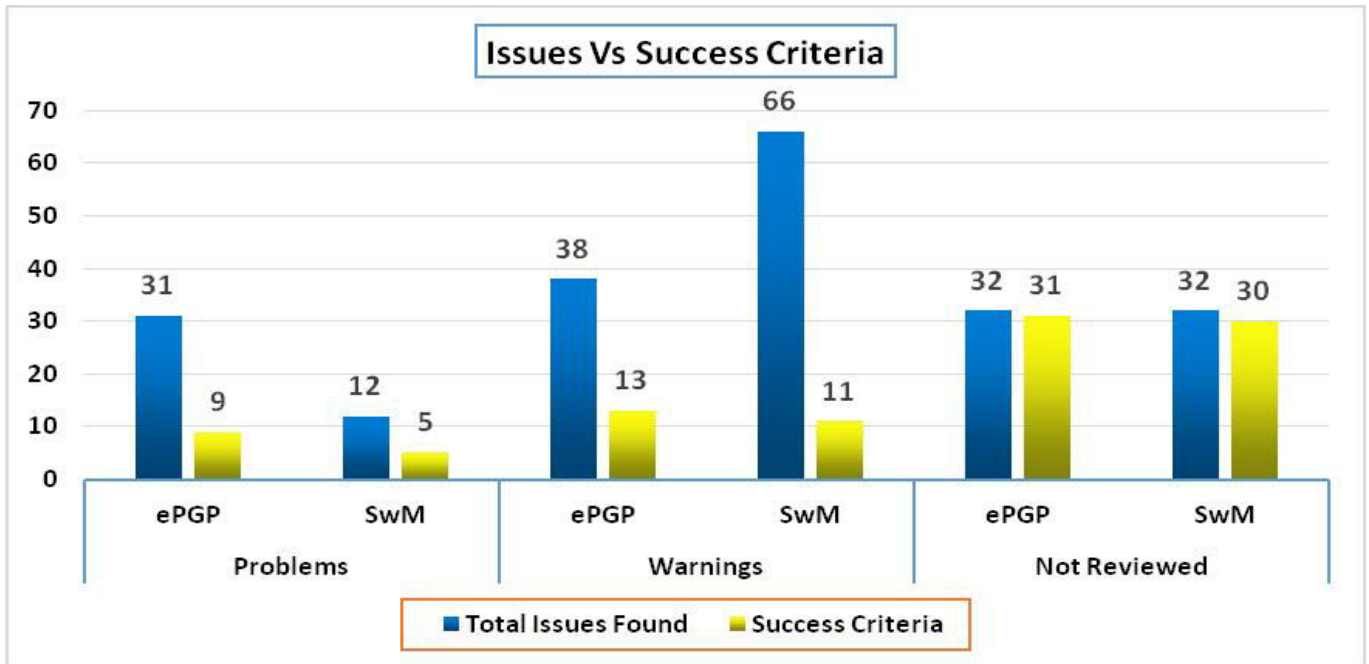


Figure 7: Issues vs Success Criteria

Figure 7 above plots the total issues identified by TAW in the target web-pages of ePGP and SwM. The statistical outcome indicates that there is a total of 31 problem issues pertaining to 9 success criteria in ePGP and 12 problem issues in 5 success criteria in SwM. Similarly, in the case of Warnings, ePGP results in 38 issues in 13 success criteria and SwM results in 66 issues in 11 success criteria. Following, 32 not-reviewed issues found in 31 success criteria for ePGP and 32 not-reviewed issues found in 30 success criteria in SwM.

Descriptive Statistics

Descriptive statistics is the branch of statistics that develops where necessary, methods for collecting, processing, quantitative and

qualitative analysis of data. The objective of the descriptive statistics is to summarize or represent, through statistics, the data available when they are numerous.

There are various types of statistics that are used to describe data (Table 3):

- Measures of central tendency (i.e. Mean, Median, Mode & Sum)
- Measures of dispersion (i.e. Std. Error of Mean, Std. Deviation, Minimum & Maximum)
- Quartile values (i.e. Valid & Missing values)
- Measures of distribution (i.e. Shapiro-Wilk test for Normality)
- Distribution plots (i.e. Box plot & Q-Q plot)

Table 3: Descriptive Statistics

Descriptive Stats:			
	ePGPathshala (ePGP)	SWAYAM (SwM)	
Valid	36	36	72
Missing	0	0	
Mean	2.806	3.056	
Standard Deviation (Std Dev/SD)	3.241	4.472	
Shapiro-Wilk	0.809	0.731	
P-value of Shapiro-Wilk	< .001	< .001	
Minimum	0.000	0.000	
Maximum	12.000	16.000	

Boxplots: ePGPathshala SWAYAM

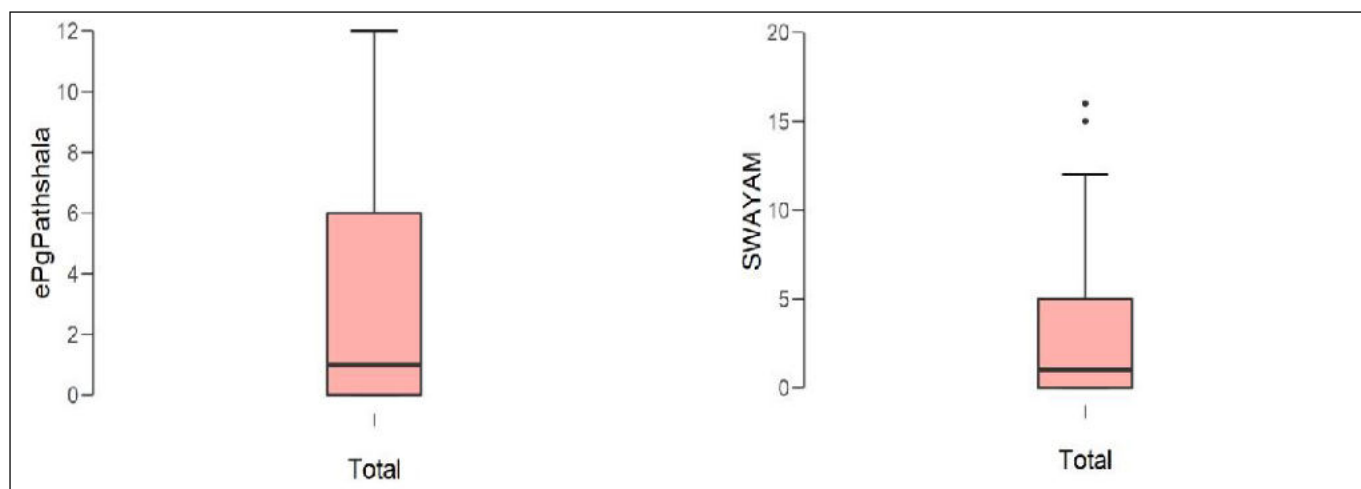


Figure 8: Boxplots: ePGP & SwM

Tests of normality

Shapiro-Wilk tests were conducted in order to determine whether the distributions of ePGPathshala and SWAYAM were significantly different from a normal distribution. The following variables had distributions which significantly differed from normality based on an alpha of 0.05: ePGPathshala ($W = 0.81, p < .001$) and SWAYAM ($W = 0.73, p < .001$). The results are presented in Table 4 below.

Table 4: Shapiro-Wilk Test Results

Variable	W	p
ePGPathshala	0.81	< .001
SWAYAM	0.73	< .001

Since the calculated p-value is less than the critical value ($Q = .001$), the null hypothesis (H_0) i.e., “there is no positive correlation among the four WCAG 2.1 Principles (POUR) between ePGPathshala and SWAYAM” is rejected in favour

of the alternate hypothesis (H_1) i.e. “there exists a positive correlation among the four WCAG 2.1 Principles (POUR) between ePGPathshala and SWAYAM.

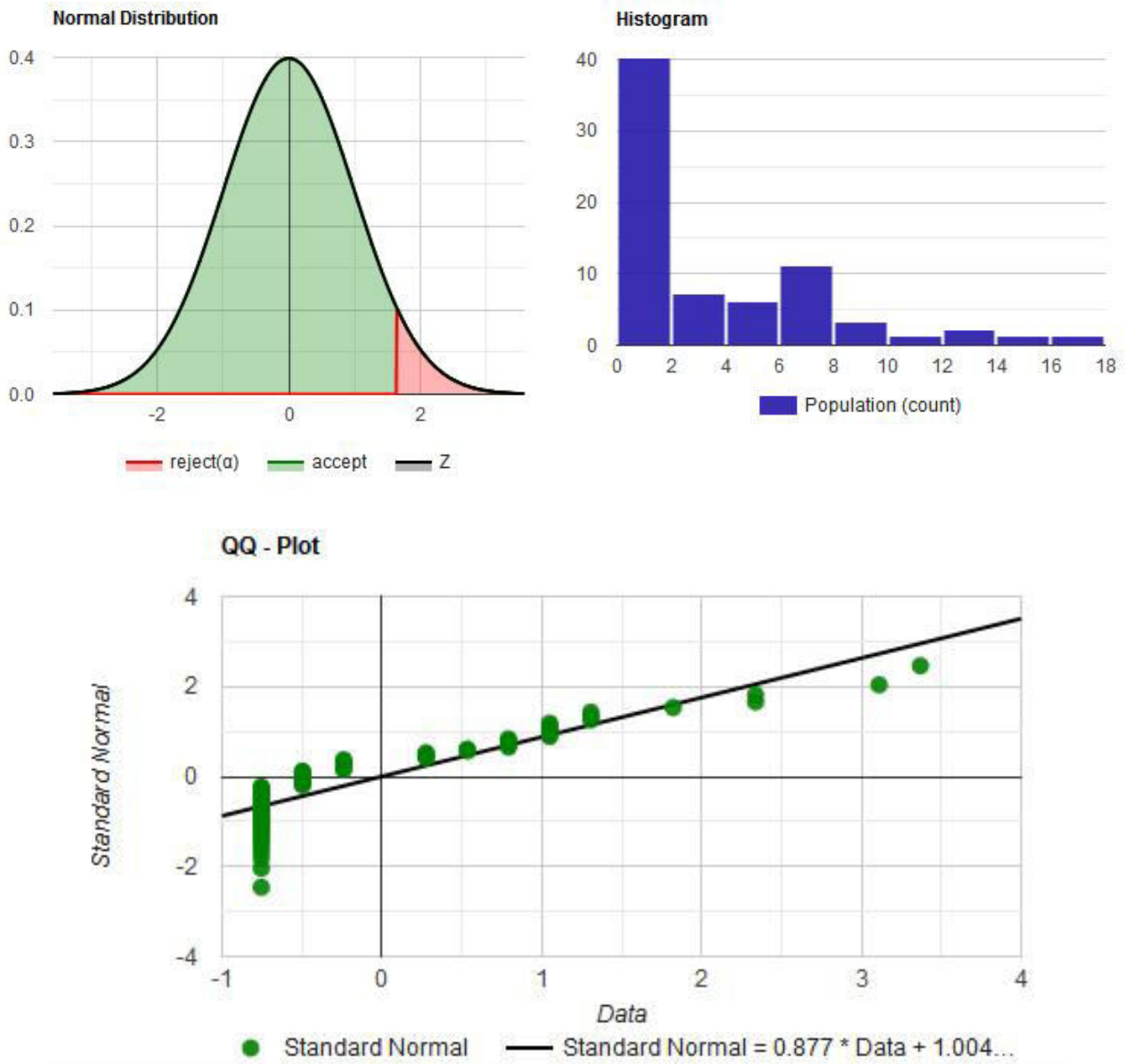
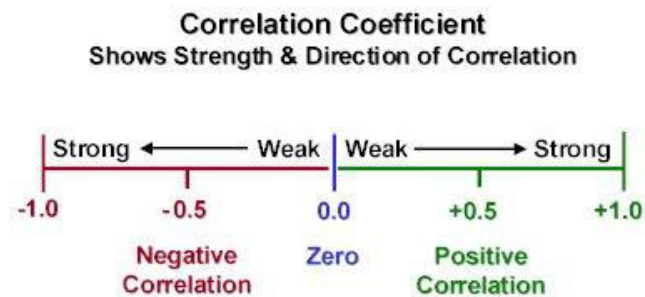


Figure 9: Normal Distribution, Histogram and QQ-Plot

The null hypothesis for this test of normality is that the data are normally distributed. The result obtained by these tests (Table 5) and the calculated p-value below 0.05 indicates the null hypothesis is rejected. Hence, the data are not distributed normally.



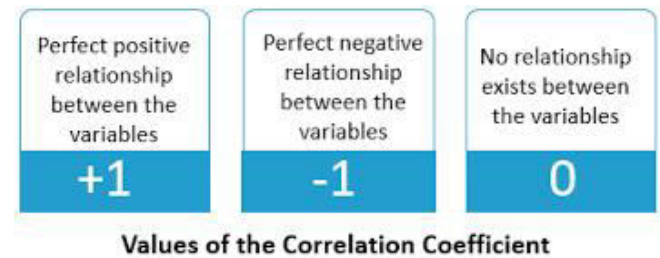
A value of ± 1 indicates a perfect degree of association between the two variables. As the correlation coefficient value goes towards 0, the relationship between the two variables will be weaker. The direction of the relationship is indicated by the sign of the coefficient; a + sign indicates a positive relationship and a – sign indicates a negative relationship. In the present case a Spearman correlation analysis was conducted between ePGPathshala and SWAYAM. Cohen’s standard was used to evaluate the strength of the relationship, where coefficients between 0.10 and 0.29 represent a small effect size, coefficients between 0.30 and 0.49 represent a moderate effect size, and coefficients above 0.50 indicate a large effect size (Cohen, 1988).

(a) Assumptions:

- **Monotonic Relationship.** A Spearman correlation requires that the relationship between each pair of variables does not

Correlation Analysis

Correlation is a bivariate analysis that measures the strength of association between two variables and the direction of the relationship. In terms of the strength of relationship, the value of the correlation coefficient varies between +1 and -1.



change direction (Conover & Iman, 1981). This assumption is violated if the points on the scatterplot between any pair of variables appear to shift from a positive to negative or negative to positive relationship. Figure 10 presents the scatterplot of the correlation. A regression line has been added to assist the interpretation.

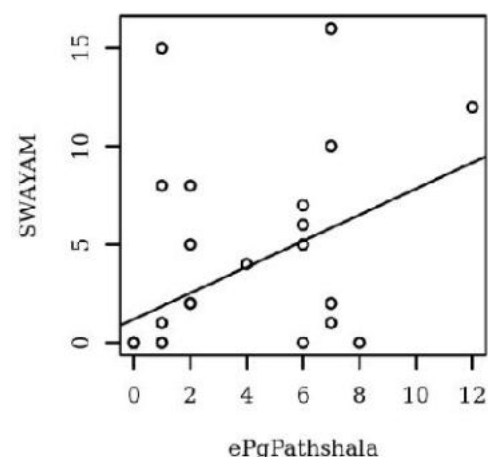


Figure 10 : Scatterplots between each variable with the regression line added

(a) Results:

The correlations were examined based on an alpha value of 0.05. A significant positive correlation was observed between ePGPathshala and SWAYAM ($r_s = 0.67, p < 0.001$). The

correlation coefficient between ePGPathshala and SWAYAM was 0.67, indicating a large effect size. This correlation indicates that as ePGPathshala increases, SWAYAM tends to increase. Table 5 presents the results of the correlation.

Table 5: Spearman Correlation Results Between ePGPathshala and SWAYAM

Combination	r_s	Lower	Upper	p
ePGPathshala-SWAYAM	0.67	0.44	0.82	< 0.001
<i>Note.</i> The confidence intervals were computed using $\alpha = 0.05; n = 36$				

CONCLUSION

Accessible learning to all including visually impaired persons can be ensured by labelling to indicate what learning needs the resource addresses, use of open licences for adaptations and variations, support flexible styling (e.g., enlarging the font, enhancing the colour contrast and adjusting the layout for students with vision impairments or mobile devices), support keyboard control of functions and navigation (for students who cannot use or do not have access to a mouse or pointing device). OER Eliminates unnecessary duplication of efforts by offering the possibility of mixing; adapting and extracting asset(s) while removing costs and problems posed by copyrights. OER are linked to the Open access movement, supported by librarians worldwide from its inception (IFLA Statement). OER should be open and accessible to students with a diversity of learning needs including those with vision issues as the learning needs are also affected by sensory, motor, cognitive, emotional and social constraints. While such movements and initiatives are focused towards citizens of the world, WIPO’s Marrakesh VIP Treaty (MVT) (India becomes the

first country to ratify the Marrakesh Treaty to facilitate access to published works for persons who are blind, visually impaired, or otherwise print disabled on 30th June, 2014) (PIB, 2014) and the Web Content Accessibility Guidelines (WCAG) cater to the requirements and rights of the persons with vision aberrations and other such bodily deficiencies which deprives individuals from accessing information and knowledge building a steeper and deeper knowledge divide.

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