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Impact of Socioeconomic Factors and Technological Infrastructure on the Accessibility of Open Educational Resources (OER) in Pakistani Universities

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Abstract:

Openeducational resources (OER) pertains to educational, academic, and research resources that are accessible online without any cost or restrictions to everyone. The Reasons behind Conducting the Research was to explore "How do socioeconomic factors and technological infrastructure impact the accessibility of open educational resources (OER) in Pakistani universities?" The quantitative research method was used to achieve the set objectives.The study included 450 undergraduates' students from 10 different universities in Pakistan. An electronic Google form surveyusing a self-structured, five-point Likert scale was used to collect the data. The findings have shown that institutions' ability to provide students with free educational resources is heavily influenced by a variety of socioeconomic conditions. Research also showed that Pakistan's internet infrastructure affected open educational resources (OER) used at the country's institutions. The study recommended that Technical infrastructure, financial aid, and technical skill development were recommended to improve access to Open Educational Resources (OER).

Introduction:

Since the introduction of the term "open educational resource" (OER), different groups and individuals with expertise in the field have presented various definitions of the term, each reflecting their own perspective on its importance. Atkins et al(2007) introduced the term "open educational resources" (OERs) to describe scholarly or instructional materials that are freely

accessible to the public. This information is highly valuable for both classroom instruction and scholarly research.

Open educational resources (OER) are becoming increasingly popular in higher education as a modern trend. The widespread availability and use of technology play a crucial role in this phenomenon. Course materials, student work, and research papers are all types of resources that are readily accessible to the public or have been shared under an intellectual property licence that allows for unrestricted use and modification. Anything that may be used to teach or learn new things falls under this umbrella term, including courses, modules, textbooks, online videos, exams, software, and more.According to UNESCO (2002) and Andrade, et al (2011), the fundamental principle of "open educational resources" (OER) is the ability to authenticate publicly accessible content and alleviate concerns around ownership. While there is ongoing discussion on the precise definition of "open educational resources," it is widely recognized that the term originated from a conference arranged by the Hewlett FoundationPublic domain or licensed works available for teaching, learning, and research purposes. The OECD defines Open Educational assets as free and public use of these digital assets in the classroom, library, and beyond by educators, students, and self-learners. This data comes from OECD 2007 report. Virtual learning, e-learning, web-based learning, and online courses are some of the numerous titles that are used to refer to online education. The word "e-learning," which is an abbreviation for "electronic learning," is a broad phrase that encompasses the use of online technologies. Some open practices in education, such as distant learning, are instances of open education (Blackall, 2007; Khanna, P., & Basak 2013). These activities have emerged as a result of the fast development of technology and the ubiquitous availability of the Internet around the world. In 1985, Richard Stallman established the Free Software Foundation with the intention of bolstering the free software movement and providing users with increased freedom. According to Caswell et al. (2008), this was the very first occasion that the concept of open educational resources (OER) was introduced in an official capacity. By establishing the Free Software Foundation in 1985, Richard Stallman hoped to lend support to the free software movement and, by extension, pave the way for the development of OER. According to Wiley (2008), the term "learning objects" was used by Wayne Hodgins in 1994 to characterise online educational

resources that could be shared around the world. Even later, in 1999, Open Courseware (OCW) came into being. A forum conference was held by the United Nations Educational, Scientific, and Cultural Organisation (UNESCO) in 2002 to discuss the effects of Open Courseware (OCW) on higher education in developing nations; this was the formal launch of Open Educational Resources (OER) in the same year (Conole, 2012; Tuomi, 2013).Academics such as Khanna and Basak (2013) compared the idea of open educational resources (OER) to learning objects while the movement was in its early stages due to the materials' potential for reuse.Open educational resources (OER) may help ensure that all people, regardless of where they live, have access to a high-quality education, according to the belief system of the William and Flora Hewlett Foundation (2013). To achieve this goal, a plethora of learning materials, such as books, curricula, lectures, and online courses, are made freely or inexpensively available online.

Another thing that ought to be done is to do ongoing research on open educational materials, often known as OERs. It is of the utmost importance to have creative approaches, strategies, and financial aid when it comes to the provision of open educational materials that are of a high quality and cover a comprehensive syllabus. Challenges encompass the development of high-quality models, the need for remote and collaborative work, and the rapid expansion of internet technology. This research does not address the social aspects of "OER quality," but it is equally important to thoroughly examine the technical aspects. OERs are identified using technical quality criteria. Alongside adherence to applicable laws, regulations, and best practices, these criteria encompass distinct characteristics and traits. Open Educational Resources (OER) enable users to retain, modify, merge, and redistribute them. Despite the increasing knowledge about OERs among schools and instructors, their usage among undergraduates remains low. Learning objects can vary in complexity, ranging from basic text or audio files to more intricate multimedia materials. Thoughtfully crafted ones can accomplish an educational objective. Teachers and students have the ability to **personalize** "Open Educational Resources" (OER) as they are easily accessible online. Open licencing allows users to freely reuse material in order to enhance their learning experience. Students have the option to work on their own or in groups when provided with activities and materials to achieve their learning goals. Educators **utilize** learning design to enhance technology integration in their courses through the creation of

innovative strategies, tools, and resources. According to Bell and Johnson (2019), library workers have been at the forefront of advocating for the mandatory use of open educational resources (OER) in schools and for reducing textbook prices. This project has garnered support from a wide range of individuals, including school administrators, classroom teachers, and students. The main reason for this support is the potential to decrease reliance on expensive textbooks from bookshops. Colvard, Watson, and Park (2018) and Delgado, Delgado, and Hilton III (2019) discovered that Open Educational Resources (OER) have no negative impact on college students' academic performance. Institutional and governmental policies, processes, and infrastructure are what we mean when we speak about structural conditions. Social "structure" is defined by Archer as the immutable, autonomous, and enduring features of societal roles, organizations, and institutions that exist beyond any one generation (Archer, 1995). One may find Archer's use of the term "structure" to describe social groups throughout his writings. Archer further differentiates cultural "products" from "ideas". On the other hand, "culture" pertains to the ideational components of social activity, such as beliefs, theories, and value systems.

Open Educational Resources (OER) have a long-term future because of the value they provide to education. According to research by Koohang and Harman (2007) and Bannan-Ritland et al. (2000), instructional philosophies like constructivism influence the presentation and design of OER, which in turn affects its usefulness. Political centralization does not significantly impact the standards or frameworks for open educational resources (OER) since institutions or individual faculty members often handle this issue, even though many of the examined nations do not have official national standards or quality frameworks for OER. Open educational materials are not universally accepted, however some countries have developed evaluation standards, checklists, or recommendations (Koohang & Harman, 2007). Open Educational Resources (OER) programmes have several financing options. Elgg and LAMS employ the Conversion Model to convert free users into paying clients. Like PLoS Open Access, the Contributor-Pay Model requires contributors to pay for maintenance. Both models are possible. The Sponsorship Model funded Stanford on iTunes and MIT iCampus, two OER programmes. The UN supports OER projects, while institutions like MIT OpenCourseWare

produce them. Each project requires a particular funding source due to its unique goals and setting. With open educational resources (OER), among other social and pedagogical purposes, the goal is to transfer control from schools to students. The usage of these products for both academic and casual learning may be utilized by individuals throughout their whole lives. The open educational resource (OER) model presupposes that the creation of information and the development of curricula are collaborative processes in which students take part. Students have the ability to personalize their educational experiences through the use of open educational resources (OER), which results in a curriculum that is more adaptable. It is possible that new methods of course assessment and certification may be required as a result of this trend towards non-formal learning. Within the context of open educational resource (OER) programmes that aim to cultivate community growth, educators get together to build "Communities of Practice," where they collaborate to address learning and teaching needs and develop resources that are based on practice.

The most effective method for maintaining the relevance of open educational resources (OER) is to include content generation within these communities. With the identification and encouragement of user communities, open educational resource (OER) programmes are able to flourish more effectively. Learning may be adapted to conform to a new culture if communities are able to make better use of the resources at their disposal.provide open educational resources (OER), which give students more control over their own education. Learning, when seen as a social activity, comprises the production of new information through group efforts. Students are encouraged to pick their own learning method through the promotion of open educational resources (OER), which lead to a more flexible curriculum. The ongoing dissemination of open educational resources (OER) is contingent upon both the creation of new material and the enhancement and refining of old information, subject to licence restrictions, as OER gains popularity and acceptance. Along with the rise of non-formal education, there is a growing demand for adaptable evaluation and certification processes. A plausible observation can be made with regard to Pakistan. Due to the fact that the OCWC acknowledged the VUP OCW portal, it is clear that institutions are becoming increasingly interested in Open Educational Resources (OER). Within the framework of a formal setting at a different school, one example of

the wider effect of open educational resources (OER) is the creative use of video lectures and virtual university courses by a teacher. With the implementation of VUP video lectures and the establishment of a viewing schedule, the teacher has observed a significant increase in the level of student involvement in the class. Because of the systematic approach that has resulted in class discussions that are focused around topics that have been well researched, the incorporation of open educational resources (OER) into traditional teaching techniques has been a good outcome. Consequently, there is a growing sense of optimism and anticipation over the future of open educational resource (OER) projects being implemented. This study was conducted with the intention of attempting to investigate the impact that socioeconomic factors and technological infrastructure have on the accessibility of open educational resources (OER) in Pakistani universities.

Research objectives:

- To examine the impact of various socioeconomic variables on the use and accessibility of open educational resources (OER) in Pakistani universities.
- Find out the impact of technological infrastructure on the accessibility of open educational resources (OER) in Pakistani universities.

Hypothesis of the study

H0: There is no significant impact of various socioeconomic variables on the use and accessibility of open educational resources (OER) in Pakistani universities.

H0: There is no significant impact of technological infrastructure on the accessibility of open educational resources (OER) in Pakistani universities.

Research Methodology:

The Quantitative Approach In order to obtain numerical data on socioeconomic situations, technical infrastructure, and accessibility to open educational resources (OER), quantitative methodologies was utilized.

The Study's Population and Sampling

Four hundred fifty undergraduates from ten different Pakistani institutions participated in the research. Among the provinces in which these institutions were situated were Sindh (two), Balochestan (two), Khyber Pakhtunkhwa (two), and Punjab (two). The sample also includes two

universities from Azad Kashmir. 450 undergraduates from each university, each with distinct academic courses, participated in this research.

Research Instrument:

Students from a variety of cultural backgrounds, geographical locations, and academic departments at universities in Pakistan and Azad Kashmir were surveyed to get their thoughts on how socioeconomic factors and technological infrastructure affect the availability of open educational resources (OER).The survey was conducted utilizing an electronic survey that consisted of a close-ended self-structured five point Likert questionnaire. This study collected information about how the price of instructional materials affects the utilisation of Open Educational Resources. The difficulty that students from lower socioeconomic backgrounds encounter while trying to use OER is greater. There are enough digital resources provided by the institution to help with open educational resource usage, Online open educational resources (OER) are influenced by the digital resources that are accessible, the difficulty of obtaining OER materials online, and one's level of technological literacy, which impacts one's ability to use OER platforms efficiently. Open Educational Resource (OER) training, instruction on many technological platforms, Facilitating access to Open Educational Resources, informational digital resources, and Enhanced web-based systems.Thestudents who were chosen for the sample were asked to fill out a questionnaire with 25 items. Cronbach's Alpha for this research tool was 0.846, indicating high levels of internal consistency across the items.

Data Collection and Data Analysis

The process of gathering pertinent information is the most time-consuming and important aspect of any investigation. Researchers often employ electronic surveys as a means of data collection in order to gain valuable information. In- To find out how two or more variables are related to one another, statisticians use regression analysis. Its goal is to use one or more independent variables to predict the value of a dependent variable. This is why regression analysis (ANOVAa, Linear Regression) was used by the researchers. Open Educational Resources (OER) are a valuable tool for higher education in Pakistan, and this study looks at how socioeconomic characteristics and technical infrastructure affect their accessibility and usage.

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Data analysis of the study:

Table NO: Impact of Socioeconomic factors on accessibility of open educational resources in Pakistani universities

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.829[a]	.687	.687	1.12568	.687	985.513	1	448	.000	1.334

a. Predictors: (Constant), socio economic factors

b. Dependent Variable: accessibility of open educational resources in Pakistani universities

Model Summary

Table No showed the results of the regression analysis; a model was developed to predict the availability of free educational resources in Pakistani institutions. The model had an excellent fit (R = 0.829) and high explanatory power (R Square = 0.687). The model's performance was significantly improved once socioeconomic factors were included as predictors, as seen by the high F Change value (< 0.001). Since the adjusted R Square did not differ from the original R Square, it follows that adding the additional predictors did not reduce the model's goodness of fit. In the context of Pakistani universities, the findings show that socioeconomic factors are important to consider when trying understanding accessibility of open educational resources in Pakistani universities.

ANOVA[a]

Table NO: Impact of Socioeconomic factors on accessibility of open educational resources in Pakistani universities

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1248.796	1	1248.796	985.513	.000[b]
	Residual	567.684	448	1.267		
	Total	1816.480	449			

a. Predictors: (Constant), socio economic factors

b. Dependent Variable: accessibility of open educational resources in Pakistani universities

The table showing results from the analysis of variance shows that there is a significant relationship between the predictors of socioeconomic characteristics and the accessibility to open educational materials in universities in Pakistan (F = 985.513, p < 0.001). Given that the residual sum of squares is only 567.684, but the regression sum of squares is 1248.796, this suggests that the model explains a large portion of the dependent variable's variation. The results show that economic and social variables have a major impact on how open educational materials are in Pakistani universities.

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Coefficients

Table NO: Impact of Socioeconomic factors on accessibility of open educational resources in Pakistani universities

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.546	.218		7.101	.000	1.118	1.974
	socioeconomic factors	.817	.026	.829	31.393	.000	.766	.868

a. Dependent Variable: accessibility of open educational resources in Pakistani universities

Table No Findings demonstrate its significance in the model, the constant term has a coefficient of 1.546 ($t = 7.101$, $p < 0.001$). Having a value of 0.817 ($t = 31.393$, $p < 0.001$), the socioeconomic variables predictor emerges as a very important factor, indicating a substantial positive correlation with accessibility. Open educational materials become more accessible as a result of improved socioeconomic conditions. This predictor's influence is reliable since the 95% confidence interval for the socioeconomic component coefficient is small, going from 0.766 to 0.868. The results show that socioeconomic considerations are the main determinants of the availability of free educational materials in Pakistani institutions.

Model Summary

Table NO: Impact of technological infrastructure on accessibility of open educational resources in Pakistani universities

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.795[a]	.631	.631	1.22246	.631	767.509	1	448	.000	1.967

a. Predictors: (Constant), technological infrastructure

b. Dependent Variable: accessibility of open educational resources in Pakistani universities

Table No shows the results of regression analysis was carried out to examine the availability of free educational resources in Pakistani institutions. That study's findings are summed up in the model. The included predictor, technological infrastructure, explains around 63.1% of the variability in accessibility, showing a fair fit in the model (R Squared = 0.631). Taken into

consideration the F-change statistic, which is statistically significant (767.509, $p < 0.000$). The fact that the adjusted R Square stays equal to the initial value demonstrates that include technical infrastructure as a predictor does not impact the model's goodness of fit. The findings of this research highlight the significance of Pakistan's technology infrastructure in determining the availability of free educational materials in university setting.

ANOVA[a]

Table NO: Impact of technological infrastructure on accessibility of open educational resources in Pakistani universities

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1146.980	1	1146.980	767.509	.000[b]
	Residual	669.500	448	1.494		
	Total	1816.480	449			

a. Dependent Variable: accessibility of open educational resources in Pakistani universities
b. Predictors: (Predictors: (Constant), technological infrastructure

This regression model, which uses technical infrastructure as a predictor, explains the variation in the accessibility of free educational materials in Pakistani institutions. The ANOVA table gives insights into this variance. Evident from the enormous F statistic (767.509, $p < 0.001$), the regression model is quite significant. Considering that the residual sum of squares is 669.500 and the regression sum of squares is 1146.980, it is clear that technical infrastructure plays a pivotal role in explaining the accessibility variability. These findings add weight to the argument that Pakistani universities' technical infrastructure is a key factor in determining how easily students may access free educational materials.

Coefficients[a]

Table NO: Impact of technological infrastructure on accessibility of open educational resources in Pakistani universities

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.496	.318		-1.559	.120	-1.121	.129
	Technological infrastructure	.350	.013	.795	27.704	.000	.325	.375

a. Dependent Variable: accessibility of open educational resources in Pakistani universities

Table No shows that model predicts the accessibility of open educational materials in Pakistani institutions using technical infrastructure as the predictor. The regression coefficients for this model are shown in the coefficients table. There is no statistical significance for the constant

component, as shown by its unstandardized coefficient of -0.496 (t = -1.559, p = 0.120). On the other hand, there is a very significant and positive correlation between accessibility and technical infrastructure, as shown by the coefficient of 0.350 (t = 27,704, p < 0.000). With a beta value of 0.795, the standardized coefficient highlights how important technical infrastructure is for accessibility. Open educational resource accessibility at Pakistani institutions may be explained by the technical infrastructure coefficient, which has a 95% confidence interval ranging from 0.325 to 0.375.

Model Summary

Table NO: Impact of socioeconomic factors, technological infrastructure on accessibility of open educational resources in Pakistani universities

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.862[a]	.744	.743	1.02037	.744	648.831	2	447	.000	1.447

a. Predictors: (Constant), socioeconomic factors, technological infrastructure

b. Dependent Variable: accessibility of open educational resources in Pakistani universities

Table No shows that R Squared value of 0.744, the model shows a good fit; this means that the included predictors explain around 74.4 percent of the variation in accessibility. With both socioeconomic variables and technical infrastructure serving as predictors, the model's strong goodness of fit is confirmed by the modified R Square, which remains constant with the initial value. According to the change statistics, the model's performance was significantly enhanced when socioeconomic characteristics and technical infrastructure were included, as shown by the high F Change statistic (648.831, p < 0.001). Taken together, these results highlight how socioeconomic elements and technical infrastructure work together to explain, in great detail, how open educational materials are accessible in institutions in Pakistan.

Findings of the study:

- The findings indicate that socioeconomic considerations play a crucial role in determining the accessibility of open educational resources in Pakistani universities.
- The findings confirmation that economic and social factors significantly influence the accessibility of free educational resources in Pakistani institutions.
- The findings of this research highlight the significance of Pakistan's technology infrastructure in determining the availability of free educational materials in university setting.

- These findings add weight to the argument that Pakistani universities' technical infrastructure is a key factor in determining how easily students may access free educational materials.
- With a beta value of 0.795, the standardized coefficient highlights how important technical infrastructure is for accessibility. Open educational resource accessibility at Pakistani institutions may be explained by the technical infrastructure coefficient, which has a 95% confidence interval ranging from 0.325 to 0.375.
- These findings highlight how socioeconomic elements and technical infrastructure work together to explain, in great detail, how open educational materials are accessible in institutions in Pakistan.

Discussion of the study:

We are referring to materials that are utilized for the purposes of teaching, learning, or research and that are freely available online to everyone and everyone at no cost when we talk about "open educational resources" (OER). These items are included in the category of "open educational resources." The inquiry that served as the impetus for the study that was carried out was the issue of how the socioeconomic conditions and technical infrastructure that are present in Pakistan have an impact on the availability of open educational resources (OER) at Pakistani universities. The findings of the previous research provided evidence that the findings of Pitt (2015), which suggested that the capacity of educational institutions to offer students with free educational resources is highly impacted by a range of socioeconomic situations, were confirmed by the findings of the previous study. Through the use of open educational resources (OER) that are accessible over the internet, teachers are able to give students with materials that have been modified to meet their specific requirements. As time goes on, the implementation of instructional methodologies becomes less difficult. Students have the opportunity to save a substantial amount of money thanks to open educational resources (OER), which in turn leads to an increase in the degree of pleasure they experience. Based on the results of this study, it can be concluded that the internet infrastructure of Pakistan has an effect on the use of open educational resources (OER) in the educational institutions of the country. According to the findings of the research conducted by Bliss, Robinson Hilton, and Wiley (2013), this was proved to be the case

by the study results. There is the potential for a variety of financial savings that are of large magnitude. It is essential that open textbooks have a quality that is comparable to that of conventional textbooks, at the very least. The outcomes of this research provide credibility to the argument that the technological infrastructure of Pakistani universities is a crucial factor that plays a role in determining the ease with which students may get access to available educational materials that are free of charge. This concept was also investigated by Pitt (2015) in his thesis, where he used terminology such as "open educational resources (OER) helps faculty to provide resources that meet the needs of students." Pitt's thesis was published in 2015. The year 2015 saw the publication of Pitt's thesis. As time goes on, the implementation of instructional methodologies becomes less difficult. Students have the opportunity to save a substantial amount of money thanks to open educational resources (OER), which in turn leads to an increase in the degree of pleasure they experience. These findings are supported by De Los Arcos, Farrow, Pitt, Weller, and McAndrew (2016), who highlight the ways in which socioeconomic variables and technical infrastructure interact with one another to create an explanation that is quite detailed about the availability of open educational materials at institutions in Pakistan. In addition, these findings are supported by the findings of the aforementioned researchers. The findings of additionally provided more evidence that supported these outcomes. The most major challenges comprised of issues with the discoverability of open educational resources as well as the quality of such products. The concepts of individualized learning and open educational resources (OER) are strongly tied to one another and are closely related to one another. These results shed light on the myriad of factors that have an effect on the many components that determine the extent to which students are able to acquire essential course information. In addition to this, they emphasize the need of working together in order to cut down on economic gaps and enhance educational technologies, both of which were supported by the study. The amount of money that was spent on textbooks for students who were not participating in the Kaleidoscope Open Course program (non-KOCI), which is an open education program, was a considerable amount of money, as stated by Hilton et al. (2014). This was the amount of money that was spent. Furthermore, Bliss et al. confirmed the conclusion that was reached by the research, which said that Pakistani institutions need to get financial assistance and the development of technology

skills in order to assist in the reduction of socioeconomic disparities and to allow equitable access to open educational resources (OER).

Conclusion:

The study came to the conclusion that the socioeconomic circumstances and the technological infrastructure of Pakistani universities have a significant influence on Open Educational Resources (OERs) at such institutions. In addition to the fact that Pakistan's social and economic issues have a significant impact, the significance of Pakistan's technological infrastructure is another factor that highlights the complex dynamics that are at play. The substantial association between Open Educational Resources (OER) and socioeconomic features and technical capabilities inside Pakistani educational institutions is shown by a robust standardized coefficient. This coefficient also illustrates the crucial role of technological infrastructure. Because our findings shed light on the myriad of variables that influence students' access to course materials, we can work together to improve educational technology and reduce economic inequity. According to the findings of the research, there is a strong correlation between Open Educational Resources and educational institutions in Pakistan in terms of the economic and technical capacity of these institutions.

Recommendations:

- The study recommended that there is a pressing need to expand access to Open Educational Resources (OER) by giving higher priority to investments in technological infrastructure that enhances internet connection and provides current hardware and software.
- The research suggested providing financial assistance and fostering the development of technological skills in order to address socioeconomic disparities and make open educational resources (OER) accessible to Pakistani institutions in an equitable manner.

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