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Digital gender divide and adoption of open educational resources

Pallavi Mahesh Shettigar[a], Giridhar B Kamath[b], Jyothi Mallya[a,1]

[a]*Welcomgroup Graduate School of Hotel Administration, Manipal Academy of Higher Education, Manipal (India)*

[b]*Department of Humanities and Management, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal (India)*

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Abstract

This study aimed to understand the differences in the perception of male and female students in adopting Open Educational Resources based on the Technology Acceptance Model. A quantitative survey method was adopted to collect data from 322 students enrolled in a private university in Karnataka, India. Except for registering and enrolling on OER sites, the study did not find any digital gender differences in terms of usefulness, ease of use, and behavioral intention in adopting OERs among students.

KEYWORDS: Online Educational Resources; Digital Gender Divide, Technology Acceptance Model; Usefulness, Ease of Use, Behavioral Intention.

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1. Introduction

The world has changed since the COVID-19 pandemic spread its tentacles in 2020. Like all other industries, the education sector was also impacted; however, it managed to stay afloat by transitioning to the online platform to conduct classes. This transition necessitated the preparation of online learning materials. To overcome the time, effort and expertise needed to prepare these materials, educational institutions are increasingly adopting Open Educational Resources (OERs) that are readily available on national and international repositories (Huang et al., 2020). Besides being cost-effective and open-licensed, OERs offer additional benefits in the accuracy of the information, time efficiency and ease of use (Hilton, 2016). The COVID-19 pandemic accelerated online media adoption prompting a 500 per cent increase in telehealth consultations, with e-retail reaching 95 per cent of Indian districts and digital payments surpassing 100 million daily transactions. Interestingly, it also triggered another phenomenon: the emergence of digital differences between males and females (USAID, 2020). This necessitates researching how different genders respond to such a digital gap while accessing and adopting OERs in higher education. Identifying such factors would shed light on the enhancers and barriers to adopting online modes of teaching and learning. Such findings would be of use to academia and practitioners, enabling them to effectively leverage both the offline and the online teaching methods to their advantage and provide students with an enhanced learning experience. Accordingly, this study examines the possible digital gender divide that exists in the adoption of OERs taking into consideration a sample of students from one of the private higher educational institutes in Karnataka, India. For the operational purpose, this study defines the digital gender divide as "gender biases coded into technology products, technology sector, and digital skills education" (West et al., 2019).

Meanwhile, a report by OECD (2018) stresses the need to close the gender digital gap in the Asia-Pacific Economic Cooperation (APEC) context. The report finds that women use technology less often than men in many APEC economies. Other factors contributing to the digital gender gap are affordability, negative

[1] corresponding author - email: jyothi.mallya@manipal.edu

experiences, and lack of skills. There is evidence in the literature to support the existence of digital inequalities, which are probably growing with the evolution of digital media (OECD, 2018). Thus, more research is required in order to fully comprehend digital inequalities in specific contexts (Hilton, 2016). Additionally, it is found that women/girls tend to have lower levels of literacy and computer abilities than their male counterparts. To achieve greater gender inclusion, it is necessary to improve digital literacy and confidence (OECD, 2018). Within the Asia-Pacific region, India has had the largest gender difference in internet usage in recent years with a 40.4 percent gender imbalance, with only 15 percent of women being able to access the internet compared to 25 percent of men. Thus, based on this background, this study intends to answer the following questions:

1. Does digital gender divide exist with regards to the usefulness of OERs?
2. Does digital gender divide exist with regards to the ease of use of OERs?
3. Does digital gender divide exist with regards to the behavioral intention towards adopting OERs?

The term Open Educational Resources (OER) was first used at UNESCOs' forum on "the impact of open courseware for higher education in developing countries" in 2002. According to UNESCO, "OERs are teaching, learning or research materials that are in the public domain or released with intellectual property licenses that facilitate the free use, adaptation and distribution of resources" (UNESCO, 2021). OERs include learning and teaching content, software, videos, tutorial, programs, etc. They offer several advantages. For example, they increase the opportunities for interaction between instructors and learners; facilitate personalized form of learning; ensure openness and accessibility of education to all; allow the dissemination of academic and educational content free of cost; improve the quality of educational content; and reduce the significant time for both learners and educators (Sharov et al., 2021).

One of the initial studies on OER in the Indian context dates back to 2009 in which Manisha and Bandyopadhyay (Manisha and Bandyopadhyay, 2009) emphasized that the availability of OER to a larger and broader audience could play a pivotal role in transforming the education system. This view has been consistently supported by several researchers (Das, 2011; Kumar and Singh, 2019; Midha and Kumar, 2021). However, it is also stressed that OER adoption in India could be a success only when the challenges and the barriers to adoption are addressed. Similarly, Upneja (2020) in their study have highlighted the various benefits of adopting OERs and also the challenges that could hinder their widespread use and effectiveness.

Research interest in OERs has gained momentum since the worldwide COVID 19 outburst in 2020. Though, literature is rich on the adoption, effectiveness, and efficiency of the online education model, it is argued that at institute levels, there is a lack of guidelines on the design and development of the OERs, which could possibly hinder their quality and minimize the benefits they are intended to provide (Upneja, 2020). This view is supported by other researchers (Maharaj, Upadhyay & Trivadi, 2021; Midha & Kumar, 2021) who expressed their concerns regarding the lack of awareness of their access and applicability. Users also found difficulty in customizing OERs (Singh & Ram, 2022). Thus, it is necessary for the educational institutes to advocate the use of OERs through their library website and maximize their outreach, especially when there is a switch between offline and online modes of education due to the prevailing COVID 19 scenario.

Researchers at Delhi University studied the influence of OERs on students and found that they were all familiar with the OERs and found them simple to locate on the university website (Manju & Bhatt, 2021). Additional advantages of OERs were highlighted as user-friendliness, the availability of resources in diverse formats, and supplements to course content and their utility. In addition, those who took part in this survey said that OERs improved their ability to learn on their own and discover new areas of study. Extensive studies have been conducted on the subject, for example, the long-term benefits of OERs in education (Das, 2011), their opportunities and challenges (Dutta, 2016), the decentralized and distributed framework for OERs, OER initiatives (Tang, Lin & Qian, 2021), teachers' attitudes toward sharing and distributing OERs, and the effect of OERs on educational practice (Manju & Bhatt, 2021).

Meantime, the COVID-19 pandemic has stimulated research on OERs. A study on the acceptance of OERs among K-12 teachers using a mixed-method approach (Tang, Lin & Qian, 2020) revealed that open educational practices increased teachers' perceived ease of use and self-efficacy towards the adoption of OERs. Open educational practice is a "broad descriptor of practices that include the creation, use, and reuse of open educational resources (OER) and open pedagogies and open sharing of teaching practices" (Banzato, 2012). A study conducted in Hong Kong to investigate the perceived usefulness of OERs after the rapid switch over to emergency found that students' perceived usefulness of OER increased significantly with regards to open online courses, online tutorials, and e-books (Cheung, 2021). While studies on OERs focus on the impact and effectiveness, utilization, awareness, and barriers to adoption (Midha & Kumar, 2022), no studies have been conducted on the possible gender digital gap that affected the adoption of OERs during the COVID 19 pandemic.

The role of gender in the context of computer-related attitude has been studied (Sieverding & Koch, 2009), and it is found that male students are more confident about their abilities to access them than females (Vekiri

& Chronaki, 2008). A similar pattern is found across different age groups and cultures (Colley & Comber, 2003; Imhof, Vollmeyer & Beierlein, 2007). However, the research on gender and its impact on technology acceptance is inconclusive in its findings. While a few studies suggest that gender does not affect computer ability (Houle, 1996), few other studies found that men and women differ in terms of their attitude towards computer ability (Jennings & Onwuegbuzie, 2001). Additionally, some recent research indicates that the gender divide is shrinking in the field of information technology, particularly in terms of basic connectivity or access to the internet (Hargittai & Shafer, 2006). To account for the contradictory findings in this area, the current study examines the probable digital gender gap in the use of OERs. To achieve this objective, the current study adopts the technology acceptance model as a theoretical framework.

Technology acceptance model

The technology acceptance model (TAM) is an information systems theory that models the adoption of technology by the users. The main focus of this model is on the user's behavioral intention in adopting any technology (Davis, 1989). According to this model, when users are presented with a new technology, several factors influence their behavioral intention to adopt, notably perceived usefulness and ease of use.

Perceived usefulness (PU)

Perceived usefulness, defined as asubjective perception of users where they believe that using certain technologies can improve their work performance (Davis, 1989), is one of the fundamental constructs of the TAM. Researchers in the past have investigated the users' perception of the usefulness of OERs for learning purposes (Cheung, 2018; 2019). The findings of these studies revealed that OERs were perceived as useful by teachers and students. However, considering the different abilities of male and female students, none of these studies have explored the possible difference in the perception between the male and female students. Therefore, considering this gap, this study investigates the difference between the perceptions of the male and female students with regards to the usefulness of OER. Thus, the following hypotheses are framed for the different dimensions of PU.

Hypothesis 1a: Perceptions of male and female students differ regarding the usefulness of OER on their academic productivity

Hypothesis 1b: Perceptions of male and female students differ on the usefulness of OER in reducing the cost of education

Hypothesis 1c: Perceptions of male and female students differ on the usefulness of OER in improving their learning outcomes

Hypothesis 1d: Perceptions of male and female students differ on the useful of OER as additional educational materials

Perceived ease of use (PEOU)

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Ortinau et al., 1989). Perceived ease refers to how easy it is to access a technology system. The challenges with regards to technology adoption can be overcome if the technology is user-friendly. While extant research has investigated the effect of PEOU as a single dimension (Nazari & Abdekhoda, 2021), no study has investigated the different dimensions of PEOU and their impact across gender. Therefore, the current study investigates the impact of the five dimensions of PEOU across gender. These dimensions are registration, enrolling, language, availability, and usage.

Thus, based on these assumptions, the following hypotheses are proposed.

Hypothesis 2a: There is a difference in the perception of male and female students with regard to the ease of registration

Hypothesis 2b: There is a difference in the perception of male and female students with regard to the ease of enrolling on OER sites

Hypothesis 2c: There is a difference in the perception of male and female students with regard to the ease of understanding the language in which the content is presented.

Hypothesis 2d: There is a difference between the perception of male and female students with regard to the availability of the OER relevant to their studies.

Hypothesis 2e: There is a difference in the perception of male and female students with regard to the ease of using OER sites.

Behavioral intention (BI)

Behavioral intention refers to the motivational factors that influence a given behavior (Ajzen, 1987). If users have stronger intentions, it is more likely the behavior will be performed. It is also believed that gender plays a crucial role in affecting an individual's BI (Fakhrudin, Karyanto & Ramli, 2018). The disparity in the mindset and beliefs of men and women result in disparities in the values underlying BI. These distinctions are the product of cultural trends and biological variables. Thus, it is safe to assume that the gender effect on behavioral attention may have a strong correlation with an individual's BI.

Thus, the following hypotheses are postulated.

Hypothesis 3a: There is a difference in the perception of male and female students regarding the intention to use OERs in the future.

Hypothesis 3b: There is a difference in the perception of male and female students about the intention to continue to use OER

Hypothesis 3c: There is a difference in the perception of male and female students about the intention to use more OERs related to their learning

Hypothesis 3d: There is a difference in the perception of male and female students regarding the intention to recommend OER to their peers.

2. Materials and Methods

2.1 Background

This study adopts a descriptive survey research design because it is ideal to gain an in-depth understanding of the subject under discussion. Additionally, this method is less expensive and easy to conduct. The context of the study is a private university in Karnataka, India namely, Manipal Academy of Higher Education (MAHE). MAHE is a globally engaged institution with active partnership with more than 220 leading universities around the globe. It offers more than 350 programs across 30 disciplines and ranks 7th among Indian universities.

2.2 Measuring instrument

To capture and measure the constructs of OERs, this study used a structured questionnaire comprising of two parts. The first part had 14 statements on three dimensions of TAM. Perceived usefulness (PU) was measured using five items. The second dimension, perceived ease of use, was measured using five items. The third dimension, behavioral intention, was measured using four items – all these fourteen items were measured using a 5-point Likert scale. These items were adopted from previous studies (Mallya & Lakshminarayanan, 2017; Mallya, Lakshminarayanan & Payini, 2019). The respondents were asked to rate their agreement or disagreement on a 5-point Likert scale with 1 being strongly disagree and 5 strongly agree. The second part of the questionnaire had questions on the respondents' demographic details. The questionnaire was designed in Microsoft Form and emailed to students. Before emailing the questionnaire, the respondents were briefed about the objectives of the study. A total of 322 responses were received. The data collected using Microsoft Form was then imported to SPSS for further analysis.

2.3 Data collection

The data for this study was collected using Microsoft Forms. Before collecting the data, one of the authors explained the objectives of the study to the students and briefed them about the different types of OERs. They were asked to rate the ease of use and usefulness of the OERs. Some of the examples of OERs included: Swayam, Coursera, National digital library of India, NPTEL, PubMed, etc. After the briefing, the respondents were emailed the online form. The respondents belonged to the main three streams of disciplines: Health sciences, technical, and management. The health science respondents were students from the master's degree of Dietetics and Applied Nutrition. The technical stream included students from engineering studies (for example, BE, BTech etc.). The respondents from the management streams were from BHM (Bachelor in Hotel management).

3. Results

3.1 Sample characteristics

The participants' demographic characteristics included gender, education, age, and program of study. The total number of participants were 322. Out of these, 179 (55.6%) were males and 143 (44.4%) were females. Regarding their educational background, many of them were undergraduates (n = 258, 80.1%). The average age of the respondents was 20.5 years (SD=2.5). An almost equal number of respondents were from health science (n=106, 32.9%), technical (n=106, 32.9%), and Management discipline (n=110, 34.2%).

3.2 Hypothesis testing

Research question 1: Does gender divide exist about the usefulness of OERs?

An independent sample t-test was conducted to identify whether a significant difference existed between male and female students across the five different dimensions of perceived usefulness. The results pointed to no significant difference (Table 1). Therefore, hypotheses 1a to 1e were rejected. The possible reason for the non-significance difference in the usefulness of OERs could be the narrowing of the gender gap in terms of internet self-efficacy. However, the statistical mean was higher for females with respect to academic productivity, usefulness, and effectiveness. In the meantime, the statistical mean was higher for male students regarding the cost of education and access to more educational materials. In other words, female students perceived OERs as more effective, useful, and productive than male students. Similarly, in comparison to the female students, the male students felt the OER provided access to more educational materials and reduced the cost of the education.

Research question 2. Does a gender divide exist regarding the ease of use of OERs?

An independent sample t-test conducted to understand the possible difference in the perception of male and female students suggests that there was a significant difference in the perception of two dimensions of PEOU, namely, registration and enrolling on the OERs

sites. Female students found it more difficult to register and enroll on the OER sites when compared to the male students. The perception mean for registration was higher for men (Mean=3.96, SD=0.64) than women (Mean=.75, SD=0.851) at the $p<0.022$ level. Similarly, the perception means of enrollment was also higher for male students (mean= 4.04, SD=0.721) than female students (Mean=3.85, SD=0721) at the $p<0.017$ level. Therefore, as postulated by hypotheses (H2a and H2b), there was a significant difference between male and female students with regard to the acceptance of their registration and enrollment. However, hypotheses H2c to H2e did not find any support and were, thus, rejected.

Research question 3. Does gender divide exist about the behavioral intention towards OERs?

Further, the independent sample t-test was conducted to examine the behavioral intention of respondents across gender. The results revealed that gender did not impact the behavioral intention towards the OERs. However, female respondents had slightly higher statistical mean on all the variables of behavioral intention.

Table 1 - Details of hypotheses testing concerning the research question 1.

Hypotheses	Perceived usefulness	Gender	Mean	SD	Sig.
H1a	OER increases my academic productivity	Male	3.78	0.98	0.21
		Female	3.9	0.76	
H1b	OER saves my cost on education	Male	3.98	1.07	0.14
		Female	3.82	0.89	
H1c	OER content is useful for my academic work	Male	3.98	0.89	0.25
		Female	4.08	0.59	
H1d	OER enhances my effectiveness in learning	Male	3.66	1.05	0.10
		Female	3.83	0.70	
H1e	OER provides access to more educational materials	Male	4.12	0.87	0.44
		Female	3.62	1.05	

*Significant at the 0.05 level

Table 2 - Details of hypotheses testing concerning the research question 2.

Hypotheses	Perceived ease of use	Gender	Mean	SD	Sig
H2a	Registering on OER sites is easy	Male	3.96	0.76	0.02*
		Female	3.75	0.85	
H2b	Enrolling for OER is easy	Male	4.04	0.67	0.02*
		Female	3.85	0.72	
H2c	The language used in OER is easily understandable and clear	Male	3.97	0.78	0.61
		Female	3.92	0.71	
H2d	I get what I look for in OER	Male	3.68	0.82	0.17
		Female	3.55	0.76	
H2e	OERs are student-friendly	Male	3.85	0.78	0.33
		Female	3.71	0.80	

*Significant at the 0.05 level

Table 3 - Details of hypotheses testing concerning the research question 3.

Hypotheses	Attitude	Gender	Mean	SD	Sig
H3a	I intend to use OER in the future whenever possible	Male	3.82	0.93	0.73
		Female	3.85	0.67	
H3b	I intend to continue to use OERs for all my learning purposes	Male	3.44	1.00	0.84
		Female	3.46	0.79	
H3c	I intend to enroll for more OERs available for my learning	Male	3.67	0.90	0.81
		Female	3.69	0.65	
H3d	I would recommend OER to someone who seeks my advice	Male	3.83	0.95	0.84
		Female	3.85	0.74	

*Significant at the 0.05 level

4. Discussion and Conclusions

The gender digital divide is the gap between males' and females' ability to access and use digital technologies. It impacts gender equality because it limits women's opportunities for education and financial independence. While few reports suggest the digital gender divide has narrowed (Facts and Figures, 2021), growing evidence suggests a digital divide between males and females still exists with regard to technology acceptance (Acilar & Sæbø, 2021).

India too has been battling with a widening digital gap for some time. Restrictions enforced in the private and public spaces have been extended to the digital world for young and adolescent females (Global GLOW Team, 2021). Gender norms, which are still rooted in patriarchal nations like India, frequently limit and hinder women's equitable access to technology, particularly those from underprivileged and resource-poor families (Global GLOW Team, 2021). Due to this, females are likely to have poor digital literacy rates, remain unfamiliar with digital technologies and have uneven access to digital or electronic devices. According to the report, Indian females are 56 percent less likely than males to utilize mobile internet. Only 35 percent of active users of Internet in India are females (GSMA Connected Women, 2019).

Against this backdrop, this study sought to explore the differences in how male and female students perceive the adoption of Open Educational Resources (OER) through the lens of the Technology Acceptance Model. The uses the three dimensions of TAM: Perceived usefulness, PEOU, and behavioral intention. Employing a quantitative survey methodology, data was gathered from 322 students attending a private university in Karnataka, India. An Independent t-test was used to analyze the differences in the perception of male and female students.

The results pointed to no significant difference across five sub-dimensions of perceived usefulness. However, regarding the PEOU, the t-test results suggest a significant difference in the perception of two dimensions of PEOU, namely, registration and enrolling on the OERs sites. Female students, according to the findings, encounter greater difficulty in registering and enrolling on OER sites compared to their male counterparts. This difference signals potential issues in the user experience design of these platforms, highlighting the importance of investigating the accessibility and user-friendly aspects of registration and enrollment processes. This finding is in line with (Saha & OhidurZaman, 2017) which reveals that there is a significant gender gap in the ability to use information and communication technology (ICT). Male participants are more efficient in using ICT than female participants.

Moreover, the observed gender difference may stem from broader societal attitudes toward technology use and the need for targeted interventions and support mechanisms. Educators and platform designers should take these findings into account to ensure an inclusive learning environment that accommodates diverse user needs, fostering equal access to online educational resources for all students. Further qualitative research is warranted to gain deeper insights into the specific challenges faced by female students in these processes. Further, the t-test results indicating a lack of significant difference in Perceived Ease of Use (PEOU) and behavioral intention between male and female participants suggest a promising scenario of gender equality in technology adoption. This implies that both genders perceive the ease of using the technology similarly and express comparable intentions to engage with it. Such uniformity in user perceptions is encouraging for technology developers, highlighting the potential for universally positive and user-friendly designs that cater to a diverse user base. While these findings are specific to PEOU and behavioral intention, it is crucial to acknowledge that other contextual factors may still play a role, necessitating continued exploration.

The absence of statistical significance in the t-test results for PEOU and behavioral intention between male and female students could be attributed to various factors. Potential factors include limited sample size, high variability within groups, the sensitivity of measurement tools, the homogeneity of participant characteristics, and the possibility that, in the specific context, there genuinely are no significant differences. This underscores the importance of considering study design nuances, sample characteristics, and measurement precision when interpreting results while also signaling the need for further investigation to elucidate the complexities of gender dynamics in technology acceptance and intention in OER adoption.

The non-significant difference across other variables could also be attributed to the fact that the respondents for this study were from the urban areas. Therefore, we recommend a similar study should be conducted using respondents from the rural areas of India.

Interestingly, a recent study conducted by Coursera (Chakrabarthy, 2022) indicates a narrowing gender gap in online learning in India. India ranks second worldwide for the highest number of women learners on Coursera. According to this study, Indian women are acquiring STEM subjects at one of the world's quickest rates. The same report also reveals that the overall course enrollments of women in India increased from 26% in 2019 to 36% in 2021, owing to the Covid-19 pandemic and a push toward online upskilling courses aided by a number of online learning websites. Owing to this rapid increase in the number of women upskilling themselves, governments, corporations, and higher education institutions must address the existing gender gaps in education so that the competent female workforce may participate seamlessly in economic activities (Chowdhury and Chakraborty, 2017). Further, the recent digital infrastructure boost promised by Government of India is likely to push up the number of online women learners even more in the future from the text and communicate clearly your most significant results.

However, a systematic review conducted to understand the gender digital divide suggests that despite a notable surge in global internet and ICT usage, women, particularly in developing nations, often find themselves on the disadvantaged side of the digital divide. Although gender disparities persist in ICT access within developing countries, more pronounced concerns about second-level digital divide issues emerge in developed nations. The authors emphasized that there is a need for actionable policies to bridge this gap. Additionally, the review identifies the significant influence of sociocultural factors in explaining the gender digital divide phenomenon (Acilar & Sæbø, 2021). In conclusion, there is a pressing need for the implementation of effective policies to address these disparities and an acknowledgment of the role sociocultural dynamics play in shaping the digital divide along gender lines.

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