



RESEARCH PAPER

Exploring Income and Employment Outcomes in Digital Training Programs: A Gender Perspective

¹Fizza Malik and ²Anum Tawha

1. Lecturer, Lahore School of Economics, Lahore, Punjab, Pakistan

2. Lead-Program Research, Punjab Skills Development Fund (PSDF), Punjab, Pakistan

Corresponding Author fizza.malik89@gmail.com

ABSTRACT

This study intends to investigate the fact that whether digital training generates equal or relatively equal financial benefit in the form of post training incomes or not. This paper helps to substantiate this notion for policy makers to therefore, look into deeper side of the story that can explain this biasedness. Although the investment in training digital skills has been immense, the disparities in how males and females participate in the job market as well as their earnings have remained an immense problem in the rapidly growing digital economy of Pakistan. This paper executes the administrative and survey data of PSDF to run a Quantitative Analysis. This research approach engaged 253 participants who have undergone at least one type of digital training offered by PSDF platform in the past two years that is 2024 and 2025. The paper takes gender as the independent variable while earnings and employment are the dependent variables. In order to substantiate the significant differences in income and employment, a Multivariate Analysis of Variance (MANOVA) is used and then the effect of gender is also determining each of the dependent variables separately also. According to the MANOVA test results, the joint influence of gender on post-training employment and salary is statistically significant at a 10% level. According to univariate analysis, the significant difference caused by gender is due to salary and not employment. Employment status is not influenced by gender, although post-training salary is statistically affected by gender. This means that men and women receive different salaries for similar training in digital platforms. The lesson is that what the government and companies should do is tighten their belts: implement more strict pay-equity legislation, penalize the firms, and initiate campaigns of cultural change in case they desire actual gender parity. Altogether, the study provides tangible evidence that may be valuable to redesign the workforce development strategies in the new digital economies and rethink them.

Keywords: Gender Disparities, Digital Workforce, Skills Training, Pakistan Labour Market, Pay Equity, MANOVA Analysis

Introduction

The Eurostat (2021a) indicates that women earn an average of 14.1% less than men do as gross hourly wages. The gender pay gap continues to exist in the world and it should be subjected to further investigation. Research demonstrates that men and women respond in a varying way to the labor market (Arulampalam et al., 2005; Radl, 2013; Boll et al., 2017). Although an approximately equal number of men and women are employed in the workplace, there are gender-related barriers that affect the career choice of women.

Pakistan's economy and labor market are changing rapidly due to the country's digital transformation. With 242 million people, the nation has a sizable youth bulge, with about 26% of the population being between the ages of 15 and 29 (Pakistan Bureau of Statistics, 2023). Although this offers a chance for economic expansion, the high rates of youth unemployment also create difficulties. In recent years, academics, policymakers, and

the government have become increasingly aware of the need for quick advancements in Digital Education (DE) to boost economic growth and employment and lessen income disparities (Dobson & Muhammad, 2022). Since technology has replaced millions of jobs, it is essential to acquire digital skills in order to secure professional employment (Pirzada & Khan, 2013). Digital training is necessary to help young people find good jobs in the evolving globalization framework because it boosts their self-esteem, helps them get over feelings of loneliness, and enables them to fully engage in the job search (Bunker, 2010). Adopting digital skills has the potential to improve education, increase employment opportunities, and empower citizens in a nation like Pakistan. It might spur social change, reduce income inequality, and increase civic engagement. It has been observed that people who are more familiar with and knowledgeable about technology tend to do better than those who are not (Robinson, 2015).

In the context of increase in Digital education and training, this paper tries to distinguish between the earnings impact of different training forms on gender specific impact on employment and income levels. Much of this gender wage gap is documented due to education, experience, occupational choices, but mainly the gender discrimination is widely seen in the developing countries where women are degraded vis a vis male in the society (Altonji, Joseph & Blank,1999) due to cultural discrimination that exists. This paper however aims to explore gender specific questions that is bringing difference in the income levels, after a bunch of similar training programs that were introduced to the males and females.

There has been much research on the significant and positive impact of Digital training on employment and income, but little is provided to see the gender differences within the range of same Digital training programs for both employment and incomes. Hence, it is of immense significance to explore the impact of digitally equipped males and females on employment and incomes after training ends. Therefore, the study adds not only to academic knowledge but also to practical policymaking. From a theoretical perspective, it contributes to the current discourse on income inequality and devaluation theories aligned with human capital theory. While measuring gender gap is crucial, in the underdeveloped economies like Pakistan, the distributional effects are equally imperative because it helps us to understand the dynamics of social inequality. This data can be used by policymakers in the creation of training activities that are intended to generate jobs and more income (Si, Nadolnyak and Hartarska, 2021). The latest movement launched by the government, Uraan Pakistan, which aims at placing Pakistan as a trillion-dollar economy by 2035, relies on its capacity to embrace digital transformation. One of the elements of this transition is the arming of the young people with digital skills to enhance their employability as well as incomes.

Literature Review

The skill-based theory is relevant to the discussion of digital training and literacy. This theory was proposed by Berman (1998). According to this, technological advancement is likely to favor a highly skilled workforce, potentially magnifying income inequality. In many of the ICT domains there has a low involvement of women (Palencia, 2016). Research indicates that men tend to have a more positive outlook on using ICT compared to women, however, in another study it is shown that these gender differences in the "use" of ICTs vanish in the area of "basic and moderate knowledge" of digital instruments (Garrido, et.al 2009).

According to a UNESCO report (2019), the gender digital divide is initiated because of the limited usage of digital tools by the females in South Asia. Due to 41 % (GSMA,2023) less usage as compared to men, the job portals and digital learning platforms are limited in accessibility and so women tend to have under representation in high paying digital roles. In another contrasting view that is presented in few studies is that women tend to engage

in “softer” digital skills like data entry, digital marketing and related fields, while men are mainly dominating the technical side of the digital sectors like, website development, AI or software programming (Mott and Sharma, 2021). This is followed by some other cultural barriers that come in the form of household responsibilities that in most of the cases they do not opt for high paying digital sectors.

Gender gap in labor markets is primarily reflected by gender disparities in employment outcomes. Women are generally underrepresented in the sectors that have high paying jobs (Bertrand, 2018; Blau & Kahn, 2017; Cortes & Pan, 2018) in both developed and developing economies, however, the only contrast is different in terms of the discrimination that exists. In developing economies women are self- employed where there is greater likelihood for them to remain unpaid (Rijkers and Costa, 2012). In developing or under developed economies the concept of employment differences across gender is a clear and an informative information. Gender equality and economic growth have largely explored in terms of the benefits and advantages it reaps. Exclusion of women from the workforce or creating barrier to work is likely to result in negative effects on economic growth and sustainable socio-economic gains. The focus on gender equality has been an important point in the United Nations Millenium Development Goals (MDGs). Women employment serves as two breakthrough channels towards economic development, first it helps to alleviates poverty and secondly from a human right perspective everyone deserves the same opportunities (Anyanwu and Augustine,2012). In an audit carried by Banerjee et.al (2023), it was interesting to find out that resumes with female profiles are getting 30% less call backs as compared to males of the same academic background. Hence, this supports the fact that despite equivalent qualification this gender discrimination prevails.

Most of the gender income gap that arises in the developing nations is attributed to differences in education, experience and gender discrimination. In such countries, women are primarily seen working as households while men dominating the labor market. These dynamics are cultural driven and have a enduring impact on gender specializing in varied domains. Pre-market human capital, education, training and unexplained discrimination together pile up this gender income gap (Altonji, Joseph & Blank, 1999). Gender role and gender division also summarizes this gap, which is exasperated by other factors like non cognitive skills and a high number of family members that pose a negative impact on women’s wage.

These differences in wage gaps with respect to gender are varying across developed and developing economy. In a study, conducted on Uruguay this difference is explained due to the differences in the increased returns on education (Gonzalez and Miles 2001). While for developed economies like US, these differentials are based on the real minimum wage. Amaya & Mougnot, (2019), presented research in which gender discrimination was the main reason for this variance. Even across countries, around the globe, varied reasons and factors are contributing to this gender wage divergence. Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca, 1973) evaluates this difference in income based on two parameters. The first one explains the endowments of workers in the form of characteristics and the other one is the return on these endowments. In a study by Qureshi and Najam (2022), that disparity in female income can also be attributed to double exclusion from digital economies. It is endorsed by gender and geographical remoteness.

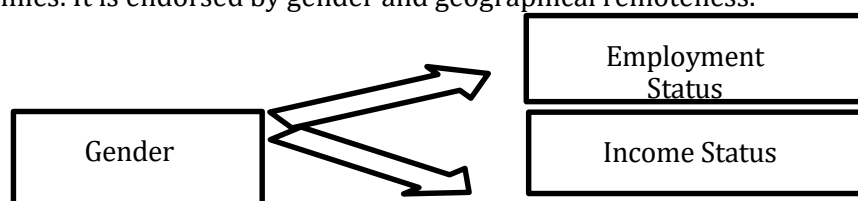


Figure 1: Conceptual Framework

The current study addresses following hypotheses:

- H1 There is a significant difference in the mean vectors of employment status across gender
- H2 There is a significant difference in the mean vectors of income status across gender

Material and Methods

Human Capital Theory serves as the foundation of this research, emphasizing the role of education and training in enhancing skills as well as employability. It states explicitly that human capital is advanced through education, on-the-job training, and vocational training and can significantly impact a society's ability to increase earnings and lead to economic development (Becker, 1962). At the same instance, occupations are strongly driven and differentiated by gender, despite women engaging in high educational and training achievements (Blau and Kahn 2016; Cohen 2013; Mouw and Kalleberg 2010). Sectors in which women tend to concentrate are likely to be paid less relative to the occupations where men are overrepresented. According to prominent human capital scholars' states that family preferences and expectations on lifetime earnings are likely to influence educational and career paths. Human capital theorist link that gendered ideas have no impact on occupational wages; however, devaluation theories negate that idea and substantiate that even after vocational trainings that are sector specific, women are undervalued and underpaid (Tam,1997; Polachek, 1987)

Technical and Vocational Education and Training (TVET) is a practical application of Human Capital Theory, providing youth with market-relevant skills. Based on the theoretical framework, research confirms that people who receive skill development training are more likely to improve their employment prospects and wages in the long run, as compared to those who do not receive the training (Nilsson, 2010). This digital training of males and females are likely to impact employment and income, but it is worth a question to inquire that whether these trained individuals pose any difference in employment status or income levels. The gender wag gap is extensively explored and established that in developed economies the salient difference between male and female earnings have started to converge. This convergence has been mainly termed as gender specific factors either in the form of qualification or labor market treatment. The theory of Human Capital however, is challenged by the Devaluation theory, that states that even women is skill enough to compete with males, she will be undervalued. In this modern era of digitalization, this theory is manifested in gendered pay scales for tech jobs that are comparable. The Occupational segregation is enrooted to the "masculinity and femineity" tags even in employment that perpetuates in wage differentials. (Eagly and Wood, 2012)

The undertaken study employs permitted data of PSDF on digital training with respect to males and females. A quantitative approach is employed to test the above stated hypotheses. Data was collected in responses by these individuals by recording their responses on changes in income and employment status post digital training sessions. This data was sorted as per the MANOVA (Multivariate Analysis of Variance). The group (gender) was taken as the independent variable while employment and income were taken as two independent variables.

The Multivariate analysis of variance (MANOVA) procedure provides regression analysis and analysis of variance for multiple dependent variables by one or more factor variables or covariates. In MANOVA, the factor variables divide the population into groups. Using this general linear model procedure, we test null hypotheses about the effects of factor variables on the means of various groupings of a joint distribution of dependent variables. In MANOVA we can investigate interactions between factors as well as the effects of individual factors. In addition, the effects of covariates and covariate interactions with

factors can be included. The MANOVA analysis is conducted on SPSS software. This technique helps us to evaluate group differences across multiple dependent variables.

Total observations available were 259, out of which only those observations were taken which had taken at least one digital training through PSDF in the last 2 years. After completion of the training, males and females were asked about their change in employment status by giving them four options; 1. Full time employment 2. Part time employment 3. Self-employed and 4. Remained unemployed. Similarly, questions about incomes earned was also asked. Again, the respondents answered this with reference to the range of income that they got after training; 1. Over PKR 70,000 2. PKR 20,000-30,000 3. PKR 30,000- 50,000 4. PKR 50,000- 70,000. After generating the results, the frequency of answers was tabulated and MANOVA was applied.

Hence, under the theoretical importance of gender difference in the income and employment post digital training is explored under two hypotheses that are generated with respect to gender, which have gone through the same kind of digital training. To validate the devaluation theory based on gender difference, two hypotheses are established:

H_{01} : There is no significant difference in the mean vectors of employment status across gender

H_{11} : There is a significant difference in the mean vectors of employment status across gender.

Second Dependent Variable (Income levels)

H_{02} : There is no significant difference in the mean vectors of income levels across gender

H_{21} : There is a significant difference in the mean vectors of income levels across gender.

In MANOVA (Multivariate Analysis of Variance), several test statistics are used to assess the significance of differences between group means, including Wilks' Lambda, Pillai's Trace, Hotelling-Lawley Trace, and Roy's Largest Root (Table 1). The MANOVA Table F-statistic for Dependent variables for univariate analysis is presented in Table 2. The decision rule is stated below.

The null hypothesis is rejected if:

1. For Dependent variable 1:

p-value of test statistic < 0.01

2. For Dependent variable 2:

p-value of test statistic < 0.01

Results and Discussion

This section reports the main findings of the study. Before employing the MANOVA model, the table below provides a demographic breakdown of the 59 participants in the treatment group, categorized by age, gender, education level, and geographical location. Most participants are between 24-28 years (i.e., 38%), followed by 30% in the 29-33 age group, 26% in the 19-23 range, and only 6% aged 34-38. The gender distribution is 88% male and 12% female participants, indicating a male-dominated sample. Regarding education, 46% hold a bachelor's degree, 38% have a master's, 15% completed intermediate education, and only 2% have matriculation. Geographically, participants are distributed across five cities, with Rawalpindi having the highest representation (i.e., 28%),

followed by Lahore (i.e., 26%), Multan (i.e., 24%), Sargodha (i.e., 12%), and Faisalabad (i.e., 10%). This demographic composition may influence findings related to digital skills training, employment, and income outcomes.

Out of these 259 respondents, only those observations are considered that have undergone some type of Digital training; hence we eliminate 6 observations from the data and will apply the data set on 253 respondents.

Table 1
Multivariate Tests (N=253)

Effects	Value	F-stat	Sig.
Gender- Pillai's Trace	0.664	4.937	0.066
Wilk's Lamda	0.336	4.937	0.066
Hotelling Trace	1.975	4.937	0.066
Roy's Largest Root	1.975	4.937	0.066

Table 1 demonstrates the multivariate tests that are drawn from the statistical technique.

Using Pillai's trace, there was a significant effect of digitally trained males and females on employment and income. $V = 0.664, p = 0.066$

Using Wilks's statistic, there was a significant effect of digitally trained males and females on employment and income. $\Lambda = 0.336, p = 0.066$

Using Hotelling's trace statistic, there was a significant effect of digitally trained males and females on employment and income. $T = 0.975, p = 0.066$

Using Roy's largest root there was a significant effect of digitally trained males and females on employment and income. $\Theta = 1.975, p = 0.066$.

The results of the tests signify that at the 10% significance level; we reject the null hypothesis. This suggests that gender has a statistically significant effect on the combined dependent variables (employment and income) among people who received digital training. Hence it supports the argument that we have built that in the developing economies like Pakistan, gender specific factors do rule out the impact of differences that exist in income levels. Despite equal tenure of training and even same training type does not generate equal income levels among the group impact.

Table 2
Univariate Tests (N=253)

Source=Gender Dependent Variable	Type III Sum of Squares	Mean square	F-stat	Sig.
Employment	200	200	2.459	0.168
Income Level	50	50	11.765	0.14

Table 2 shows the univariate impact of gender differences on income levels. The F-statistic of dependent variable 1, that is employment is coming out to be 2.459 with p-value greater than 0.10, hence it is insignificant on 10% CI (P-value=0.168). Therefore, we do not reject the null hypothesis. The F-statistic of dependent variable 2, that is income levels is coming out to be 11.765 with p-value less than 0.10, hence it is significant on 10% CI (P-value=0.014). therefore, we reject the null hypothesis. Therefore, based on the above stated results, it can be concluded that among individuals who took digital training:

- Gender significantly influences income, with statistical evidence suggesting different income levels between male and female participants.

- Gender does not have a significant effect on employment status. However, when considering both employment and income together, gender shows a significant overall effect at the 10% significance level, implying that the impact of gender is more pronounced when both outcomes are evaluated jointly.

Conclusion

This study allows the policy makers to observe the insufficient outcomes that are desired to obtain while these trainings are designed. To ensure that developing economy like Pakistan observes an effective digital transformation there is a need to ensure that post digital trainings the factors that hinders the growth of females are observed and curtailed as per to achieve the desired outcomes. The study findings suggest that despite equal digital training platforms and workshops, the income that is supposed to be generated well enough for the females is not the case. According to our research, despite the existence of equal digital training courses and seminars, the assumed revenue of the female population does not actually become a reality. This poses the question: when both genders were indeed provided with equal opportunities, then why should the results in the sphere of income be not so similar? It implies that these policy makers should reexamine some of their decisions before these initiatives become effective.

On this basis, we can indicate some policy implications on the working institutions in this field:

- 1) There should be clear channels through which to track and control female income generation.
- 2) Such avenues must be audited and reported periodically to deal with any unexpected challenges that female employees would encounter.
- 3) Furthermore, the development of these channels of sponsorship and regular cooperation with the state and NGOs might be beneficial.
- 4) The ROI of supporting vulnerable populations such as women and unemployed youths by implementing specific interventions can be high because all trained individuals become productive members of society to be broken into the vicious cycles of poverty and become agents of sustainable progress.
- 5) In order to see the training permanent, we should have greater after-program encouragement. Indeed, one of the examples is the Punjab Skills Development Fund (PSDF) which demonstrates that establishing good connections with markets, offering entrepreneurial education and accessing funds work well.
- 6) Focusing on policy areas can allow digitally literate men and women to create a highly skilled and competitive workforce, which enables more sustainable long-term economic development in Pakistan.

In Pakistan, it is training digital skills, and women are finding an opening but even equity in salary remains unattainable. The gender wage gap remains. Our study examines the reasons that look at the cultural, structural and economic forces that influence the labor market. The facts speak volumes: it is not only necessary to provide skills. The root inequalities undermining the value of women labor must be addressed in order to bring about economic justice among women.

Recommendations

The paper provides important information on the impacts of digital training on the employment and income of young people, but numerous issues remain to be investigated further. Further studies are required to examine the effect of gender equality in terms of long-term training scope and effectiveness and take a closer examination at the outcome of such relationships and in fact what is driving the gender gap. In addition, insights into the gender differences in digital training attendance and job performance may guide us to provide more inclusive and equal policy to achieve. Lastly, the modelling and results provide good driving force; nevertheless, additional understanding of the effect of digital training in reality could be enhanced by qualitative insight retrieved by beneficiaries and employers. Such directions in the future would provide higher information on the top skills development strategies.

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