

# Crafting the Digital Competence Behavior among Female Students in Developing Countries Context

Waqas Ahmed  
 UniKL Business School (UBIS)  
 Universiti Kuala Lumpur  
 Kuala Lumpur, Malaysia  
[waqas.ahmed@s.unikl.edu.my](mailto:waqas.ahmed@s.unikl.edu.my)  
 ORCID: [0000-0003-2154-7542](https://orcid.org/0000-0003-2154-7542)

Habiba Akter  
 UniKL Business School (UBIS)  
 Universiti Kuala Lumpur  
 Kuala Lumpur, Malaysia  
[habiba.akter@s.unikl.edu.my](mailto:habiba.akter@s.unikl.edu.my)  
 ORCID: [0000-0002-2347-516X](https://orcid.org/0000-0002-2347-516X)

Jawad Ali  
 Malaysian Institute of Information  
 Technology (MIIT)  
 Universiti Kuala Lumpur  
 Kuala Lumpur, Malaysia  
[jawad.ali@s.unikl.edu.my](mailto:jawad.ali@s.unikl.edu.my)  
 ORCID: [0000-0002-6015-0663](https://orcid.org/0000-0002-6015-0663)

**Abstract**—Technology integration at mass level can help the emerging economies to fill the skill gaps by enhancing the digital competency in young fellows, particularly female students. The study aims to understand and craft the predictors of digital competency among female students. Therefore, a research framework was hypothesized by enlisting the personal innovativeness, facilitating condition and social influence towards behavioral intention to become the digital competent. An online survey was conducted to collect data from female students in two developing economies i.e., Pakistan and Bangladesh. The survey resulted in 254 responses with 130 from Pakistan and 124 from Bangladesh. Structural equation modeling analysis was conducted to comprehend the behavior factors. The results portrayed that grouped responses conferred all predictors significant towards behavior intention while in Bangladesh scenario, the social influence had no impact on female students' behavior towards becoming the digital competent. The study results will support the stakeholders to comprehend the predicaments of digital competency in females from developing countries.

**Keywords**—digital competence, female innovativeness, behavioral intention.

## I. INTRODUCTION

In our world, territories and nations are classified on the basis of ethnic, social, economic, and geographical values that mainly become the reason of their development and prosperity. Different countries structure the coalitions and regional blocs for mutual cooperation and sustainable growth however many nations wouldn't be able to make it happen due to certain factors and therefore strive for development for long time. Such developing countries primarily focus on managing their budget deficit, import exports ratio, inflations, tax collections, etc. while improving the literacy rate, technological integration, skilled higher education, research enabled environment becomes the least priority. However global technological infusion, through widespread use of internet and its social, professional and governance implications, has enabled the developing countries to update various sectors of society and governance. Such integration of digitization prompts the citizen and particularly the university students to opt for self-reliance strategy in career enhancement through technology learning and management instead of solely relying on government's development programs. This includes the learning of modern digital tools and techniques for personal and professional requirement and the way to achieve the digital competency in study and job purposes [1]. This behavior to self-made digital competent yields in fruitful conclusions for university graduates and overall economy in terms of entrepreneurial mindset, freelancing and small business initiatives in information technology sector.

The developing countries like Bangladesh and Pakistan that shared the common history with economic and social systems are top in list of most internet users as Bangladesh has more than 116 million internet users i.e., 69.8% penetration rate [2] while Pakistan has more than 101 million internet users i.e., 46.4% penetration rate [3]. As learning materials are highly pervaded over the internet in form of videos, lectures, demos, live sessions, notes, podcasts, and tutorials. This encouraging usability of internet in two developing countries can possibly support for learning and development on self-directed basis for university students and graduates. Becoming the digital competent is voluntary decision of individuals [4] however numerous contextual, social and cognitive elements, among students, may enhance the process or become hurdle on the way [5]. As per the sustainable development goals (SDGs) of United Nation, the SDG5 represents the enhancing gender equality in all fields of life. While discussing about digital literacy and digital competency for girls and women, the research in this area is still at initial stage and needs more work to bring in the ways, methods, and predictors for their inclusion in digital ecosystems.

Previous studies featured the work contemplating the female and male students' comparison on basis of their digital literacy elements and particulars in Spanish universities[6]. While another study based on independent and collaborative learning pattern for information and communication technologies (ICT) among female university students portrayed the ways of digital competency enhancements [7]. However, these works were conducted in developed nations and the predicaments towards behavior change were also not discussed that could explore the behavioral shaping and prediction. Conferring the usability behavior of technology for digital learning among university students in developing countries signals the impact of personal innovativeness, performance expectancy, facilitating conditions, perceived usefulness, social influence, role of gender [8]–[10]. To comprehend and craft the behavioral intention towards digital competency among female students' a study based on social, contextual, and cognitive aspects would help to understand more resonance about female digital competency. As such research work which orchestrates the behavioral factors towards harnessing the digital competence in developing economies remained inattentive in the literature, therefore this paper aims to formulate the research framework based on cognitive feature i.e., personal innovativeness, contextual element i.e., facilitating condition and social aspect i.e., social influence to elucidate the behavior towards digital competency among female university students in two developing countries (i.e., Pakistan and Bangladesh). By doing so, the surveyed results analysis would conclude the factor of importance to heed on for bringing the female part in

digital economy. The research work also provides the comparative analysis of both developing countries in our proposed framework that could be helpful for academicians and industry experts.

## II. LITERATURE REVIEW

### A. Personal Innovativeness

Personal innovativeness (PI) is an important and dominant factor of individual end user's innovative behavior. According to [11], an individual's innovativeness is usually regarded as having risk-taking behavior. Such behaviors stimulate a person to involve in innovative experiences [12]. In general, PI means an individual's readiness to cope with advanced technology. In this study, PI refers to one's inherent tendency to experiment with technological change [11]. Students with a higher level of innovativeness are more willing to refuel more positivity than less innovative ones. The innovative students may pay attention to their desired didactic initiatives, where they wish to be able to acquire new knowledge and adjust their learning activities [13]. Such positivity is conceivable to improve students' behavioral intention to become digitally competent.

According to [14], though females' eagerness still derives from rational behaviors, they are more likely to be innovative than males. Even though females are advanced like males in creating innovative thoughts, a female's views are sometimes undermined compared to the perceptions of a male colleague, and they are not as much frequently applied in the workplace [15]. However, females and males are not equally considered for a similar task. The females' views are less valued because of the absence of collegiality, and they are lag behind in getting priority. In fact, ladies have more innovativeness than men, but they face certain restrictions [16]. Prior studies verified that PI positively impacts users' behavioral intention (BI) using information technology [8], [12]. [13] showed that PI has a positive relationship with students' BI. [17] also proved that highly innovative students tend to hold a positive BI to adopt digital learning environments. Thus, the hypothetical connection is expected as follows:

**Hypothesis 1 (H1):** PI has positive influence on female students' BI towards digital competency.

### B. Social Influence

Unified theory of acceptance and use of technology (UTAUT) model determines performance expectancy, effort expectancy, social influence, and facilitating conditions as influential predictors of behavioral intention [18]. Social influence (SI) means "the extent to which individuals' feelings, views, or actions are influenced by others in a certain period" [18]. This research contemplates SI as the way in which students can take support from others, for example, teachers, colleagues, friends, family members, top management of the university, and academic superintendents, to embrace modern technologies and utilize them to develop themselves. Studies showed that SI coming from instructors, colleagues, and friends significantly influences students' behavioral intention using digital learning environments [19], [20]. On the other hand, several studies revealed that SI does not significantly impact students' BI using information systems [9], [21]. Notably, Tsourela and Roumeliotis [22] proved that SI is a stronger determinant for females' BI to use any technology. Indeed, users can gain knowledge,

communicate effectively, improve their creativity, and develop their learning skills through SI, which supports them to use information and communication technology easily [23]. Drawing upon these deliberations, the subsequent hypothesis has been proposed:

**Hypothesis 2 (H2):** SI positively influences female students' BI towards digital competency.

### C. Facilitating Conditions

Facilitating condition (FC) are supporting elements for certain behaviour or action and the FC can support to achieve the certain task. As defined by Venkatesh et al. [18], facilitating conditions (FC) considers as the degree to which individuals believe that the organizational and technological infrastructures are accessible to support the system usage. Our study deliberates FC as the availability of technical skills development platforms and technology infrastructures within academia that may enable an individual to be digitally competent. Such digital competencies consist of an individuals' knowledge, proficiencies, talents, and other characteristics that support them to be able to do their certain duties proficiently and effectively by using digital devices. The connections between FC and users' BI are statistically significant as found by previous researchers [20], [22], [24]. Contrary to this outcome, another study's findings identified that FC fails to be a significant forecaster of students' BI [25]. However, recent research confirmed that female students are more concerned about FC than male students [21]. Further, the study evidenced that there is still required the availability of technology characteristics to upsurge ones' intention to be digitally competent [23]. Based on such evidence, following hypothesis is proposed:

**Hypothesis 3 (H3):** FC has positive impact on female students' BI towards digital competency.

### D. Research Framework

After carrying out the thorough review of past studies, the proposed research framework has been outlined. This research framework combines three determinants of female students' behavioural intention towards digital competency: personal innovativeness, social influence, and facilitating conditions. Collectively, the framework encompasses the direct effects of these predictor variables on female students' behavioral intention. The Fig 1 summarizes the overall research framework that consists of three hypotheses. This

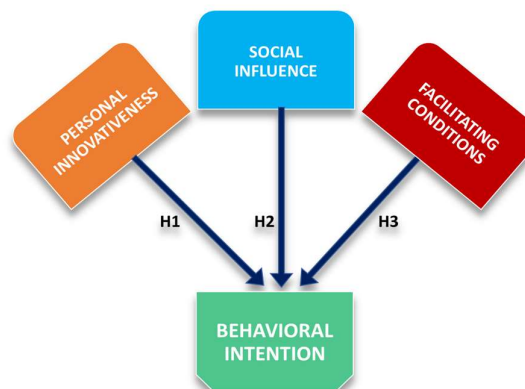


Fig.1 Research Framework

framework was assessed by the quantitative survey and then data analysis was managed through Structural Equation Modeling (SEM) analysis.

### III. METHODOLOGY

Crafting the behavior pattern through three factors, the study aligns with causal study technique with quantitative survey analysis. Data was collected based on adopted questionnaire items with 5-point Likert scale. A close-ended questionnaire was disseminated through internet to female university students in Pakistan and Bangladesh. The convenience sampling methodology was applied due to difficulty in face-to-face data collection amid Covid-19 practices. Data collection was completed around 06 weeks' time as initiated on April 05, 2021 and adequate sample size was managed on May 16, 2021. Questionnaire was based on two segments with section-A for demographic variables (age, region, studied subjects, study level) and Section-B for model variable questions. In Section-B, there were 20 questionnaire items from 04 variables (i.e., PI, SI, FC and BI) that adopted from previous validated studies [8]–[10]. Partial Least Squares Structural Equation Modeling (PLS-SEM) was implied to deduce the behavior predictor towards digital competency. PLS-SEM is based on set of analysis techniques including reliability and validity, HTMT ratio of correlation, factor loadings, f-squares, R-squares, path coefficients, regression significance values. Three different models were constructed to conclude inferences through SmartPLS 3.0 as one model for combined sample of both countries and two models for respective country-wise samples.

### IV. RESULTS

#### A. Demographic Results

Responses were resulted in total number of 254 from both countries with Pakistan=130 samples and Bangladesh=124 that are valid for PLS-SEM analysis. The demographic of collected samples are mentioned in Table I with region classification, age groups, subject studied and education level. Most of the participants were from Pakistan with 130 responses, 18-25 age group was dominant in survey, business studies students were main part of survey and bachelors' students mainly provided the answers to our online survey.

TABLE I – DEMOGRAPHIC RESULTS

Region		Age Group	
Pakistan	130	18-25 years 26-34 years	212 42
Bangladesh	124		
Subject Study			
Social Science	29	Education Level Bachelors 175 Masters 79	
Business	110		
Information Technology	67		
Engineering	48		

#### B. Reliability and Validity Analysis

Construct reliability directs the measure of internal consistency between indicators in the same construct, which is specified by Cronbach's alpha ( $\alpha$ ) and composite reliability (CR) value. The threshold value of both  $\alpha$  and CR should be  $>0.7$  to identify how sets of measurement items stipulate each construct [26]. As per our findings in Table II, it was found that both  $\alpha$  and CR values for each variable were  $>0.8$ ,

therefore, all constructs were contemplated as highly reliable. To determine the convergent validity, the average variance extracted (AVE) was assessed in our study. Our findings in Table II showed that the AVE value was  $>0.5$ , demonstrating that the threshold value had an acceptable level of variance to establish the convergent validity [26].

TABLE II – RELIABILITY & CONVERGENT VALIDITY RESULTS

Variables	$\alpha$	rho_A	C.R	AVE
Behavioral Intention	0.83	0.854	0.888	0.668
Facilitating Conditions	0.839	0.845	0.888	0.616
Personal Innovativeness	0.872	0.878	0.904	0.611
Social Influence	0.867	0.894	0.904	0.656

On the other hand, the Heterotrait-Monotrait (HTMT) ratio of correlation was assessed in order to establish discriminant validity. The HTMT is an approach measuring the similarity between latent variables. If the threshold value for the HTMT criterion is  $\leq 0.85$ , the discriminant validity can be viewed as determined [27]. In our study, this criterion (HTMT ratio  $<0.85$ ) was found while analyzing the discriminant validity as shown in Table III.

TABLE III – HTMT RATIO OF CORRELATION

Variables	BI	FC	PI	SI
Behavioral Intention (BI)				
Facilitating Conditions (FC)	0.735			
Personal Innovativeness (PI)	0.753	0.65		
Social Influence (SI)	0.466	0.345	0.38	

#### C. Factor Loadings and VIF

Our analyses in terms of factor loadings assessment specify the indicator reliability, while variance inflation factor (VIF) indicates the amount of multicollinearity in regression analysis [28]. Manifest variables with outer loadings of  $\geq 0.7$  are regarded as reliable results, while VIF values from 1 upwards show that there is statistical relevance of indicator weights in the measurement model [28]. Our study meets both criteria shown in Table IV.

#### D. Path Analysis

In this study, the PLS-SEM was applied to test the proposed hypotheses. The path analysis was performed using SmartPLS 3.0 version. In the Bangladesh context, Fig. 3 divulges that the  $R^2$  value of the female students' BI was 0.602, representing that all independent variables brought 60.2% changes to female students' BI. Based on these findings, PI ( $\beta=41.7\%$ ) and FC ( $\beta=37.5\%$ ) had a statistically significant impact on BI, while SI ( $\beta=11.7\%$ ) had an insignificant effect. Hence, H1 (PI $\rightarrow$ BI) and H3 (FC $\rightarrow$ BI) were accepted, while H2 (SI $\rightarrow$ BI) was rejected. After assessing the responses of 130 Pakistani female students, our results (as per Fig. 4) indicated that all the independent variables had acceptable predictive capabilities for BI towards digital competency: PI ( $\beta=36.4\%$ ), SI ( $\beta=23.2\%$ ), and FC ( $\beta=37.3\%$ ); thus all proposed hypotheses were supported. Fig. 2 illustrates the overall findings of the path analysis in a combined way. The results showed that PI ( $\beta=38.8\%$ ) had a high level of predictive ability for BI, followed by SI FC ( $\beta=37.2\%$ , and  $\beta=16.9\%$ ). Our results also



confirmed that PI, SI, and FC explained together 56.6% of the variance in BI. Certainly, all these variables were found statistically significant for foreseeing BI ( $p < 0.001$  and  $t > 1.96$ ), as shown in Fig 5. Hence, H1, H2, and H3 were accepted. Indeed, Table VI shows the total results of path analysis of structural equation modeling, p-value, and t-statistics. On another note, the F-square( $F^2$ ) effect sizes shown in Table V. According to Sarstedt et al. [28],  $F^2$  value  $\geq 0.30$  indicates a strong path coefficient, while value  $< 0.02$  is negligible. Interestingly, all relationships'  $F^2$  effect sizes are found strong and moderate level in our analysis.

TABLE IV – FACTOR LOADINGS AND VIF

Variable and Measurement Items	Loading	VIF
<b>Behavioral Intention (BI)</b>		
BI1 = "I am committed to achieve digital competence"	0.798	1.72
BI2 = "I plan to achieve digital competence"	0.855	2.246
BI3 = "I have intention to achieve digital competence"	0.811	1.969
BI4 = "I am willing to achieve digital competence"	0.902	2.756
<b>Facilitating Conditions (FC)</b>		
FC1 = "I have the resources and knowledge to achieve digital competence"	0.731	1.505
FC2 = "Comprehensive instructions to become digital competent is available to me"	0.879	2.747
FC3 = "Sufficient ICT facilities are available to achieve digital competence"	0.733	1.704
FC4 = "A central support is accessible towards guidance of digital competence process"	0.869	2.586
FC5 = "A particular person (or group) is available to help for achieving digital competence"	0.84	2.309
<b>Personal Innovativeness (PI)</b>		
PI1 = "I think I know more about new digital tools than my circle of friends"	0.794	1.911
PI2 = "If I heard about new digital tools, I would look for ways to familiar with it"	0.798	1.929
PI3 = "Among my peers, I am usually the first to get used to with new digital tools"	0.758	1.737
PI4 = "I like to experiment with new digital tools to achieve digital competence"	0.758	1.74
PI5 = "In general, I am not hesitant to try out new digital tools for digital competence"	0.786	1.861
PI6 = "I think I would like to use digital tools for digital competence even if I did not know anyone who had done it before"	0.806	1.991
<b>Social Influence (SI)</b>		
SI1 = "People who influence my behavior think that I should learn new digital skills to become digital competent"	0.728	1.44
SI2 = "People who are important to me think that I should learn new digital skills to become digital competent"	0.812	2.083
SI3 = "People around me who are digitally competent have more prestige than those who are not"	0.847	2.399
SI4 = "People who are digitally competent have a high profile"	0.835	2.386
SI5 = "Being a digitally competent is considered as status symbol among my friends"	0.857	2.485

TABLE V – F-SQUARE AND R-SQUARE

Sample	F-SQUARE			R Sq.	R Sq. Adjusted
	FC	PI	SI		
Combined	0.21	0.223	0.057	0.566	0.560
Bangladesh	0.201	0.235	0.028	0.602	0.592
Pakistan	0.229	0.217	0.109	0.559	0.548

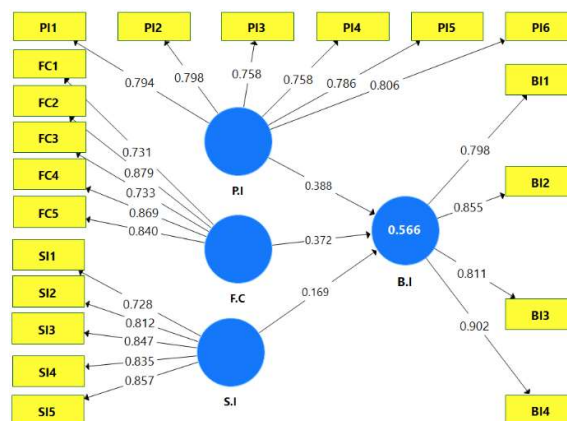


Fig.2 - Path Analysis (Combined Samples)

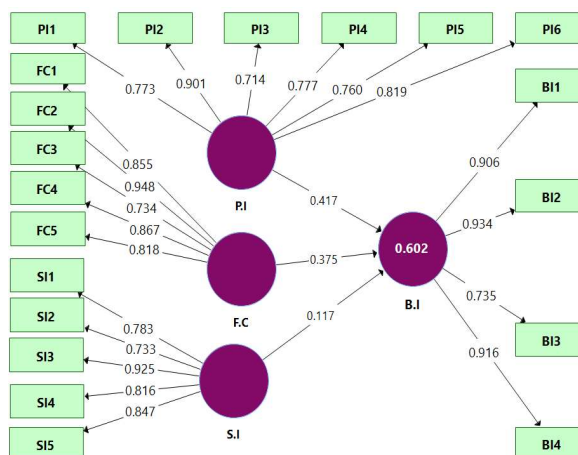


Fig. 3 - Path Analysis (Bangladesh Sample)

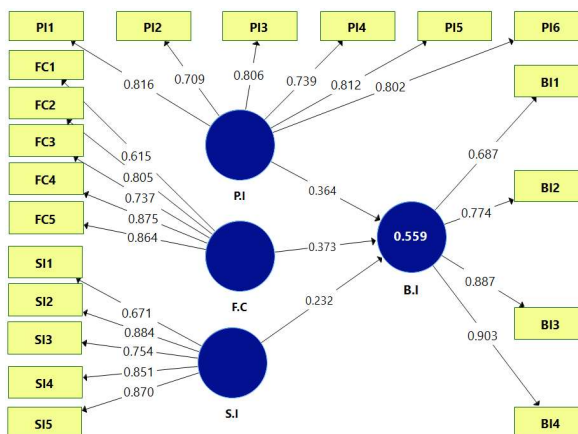


Fig. 4 - Path Analysis (Pakistan Sample)

TABLE VI – PATH ANALYSIS AND HYPOTHESIS RESULTS OF 3 GROUPS

Hypotheses		Combined Samples					Bangladesh Sample					Pakistan Sample				
		Beta	M	S.D	T Stat.	P	Beta	M	S.D	T Stat.	P	Beta	M	S.D	T Stat.	P
H1	PI → BI	0.388	0.389	0.062	6.244	<b>0.000</b>	0.417	0.413	0.098	4.25	<b>0.000</b>	0.364	0.358	0.08	4.521	<b>0.000</b>
H2	SI → BI	0.169	0.169	0.045	3.762	<b>0.000</b>	0.117	0.134	0.069	1.698	<b>0.09</b>	0.232	0.238	0.067	3.466	<b>0.001</b>
H3	FC → BI	0.372	0.373	0.07	5.356	<b>0.000</b>	0.375	0.366	0.101	3.694	<b>0.000</b>	0.373	0.376	0.093	4.024	<b>0.000</b>

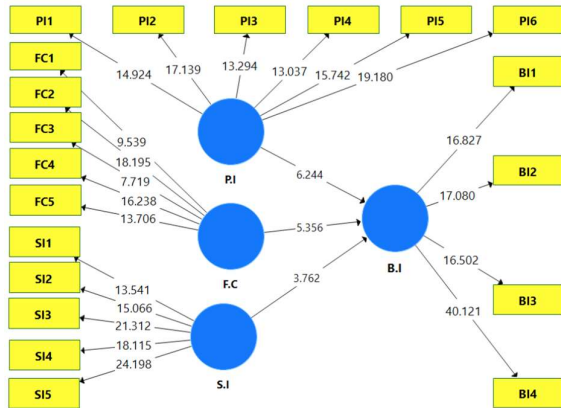


Fig. 5 – Structural Model (Combined Sample)

## V. CONCLUSION

The purpose of this study was to elucidate and comprehend the behavioral intention of female university students towards becoming the digital competent by assessing the impact of personal innovativeness, facilitating conditions, and social influence. Hypothesis findings show that all three hypotheses resulted true with significance value less than 0.05 and t-statistics more than 1.96 in combined samples as per Fig. 5. While all hypotheses in country-wise results also appeared true except H2 in Bangladesh scenario. The PLS-SEM analysis conferred that behavior to become the digital competent is impacted by personal innovativeness, facilitating conditions and social influences. As Fig. 2 shows more than 56% change in behavioral intentions (BI) of female students due to PI, FC, and SI in both developing countries while Fig. 3 portrays the 60% change in BI from Bangladesh group and Fig. 4 demonstrates around 56% change in BI from Pakistan group. Such inferences determine the impact of behavioral pattern of female students towards digital skill development in developing countries.

The study inferences formulate that technological mindset and cognitive ability to involve in innovative activities enable the female digital competence i.e., hypothesis 1. With country-wise model analysis, conclusions appeared statistically significant in both Pakistan and Bangladesh cases. In hypothesis 2, combined samples results explored that in order to prepare female students for vital part of digital economy, facilitating condition play positive and crucial role. Facilitating condition are based on digital devices (i.e., laptop, computer, tablet, smartphone), internet (economical packages, higher speed, access to online contents), software and

programs (free/ discounted registered and licensed versions for professional working), and mentors (online or face-to-face). The country-wise result also depicted the significance and positive relationship between FC and behavioral intention in both nations while in Pakistan it is yielded with highest regression weight or higher prediction power as compared to Bangladesh scenario. In our study, through hypothesis 3, impression of society also proved the important role to motivate the female student towards digitally self-sufficient and grow into useful segment of digital ecosystem in combined samples. The main distinction in this hypothesis i.e., H2 was appeared in country-wise case where social influence in Bangladesh scenario found insignificant towards behavioral intention while demonstrated significant in Pakistan scenario.

The reason behind ineffective impact of society on female behavior towards digital competence in Bangladesh is possibly due to less awareness of digital competence in the society as its IT services diffusion is less implemented at government level as compared to Pakistan's scenario where E-governance is thriving for citizens' welfare and tech awareness [29]. Interestingly, Bangladesh model showed more impact on behavior i.e., 60% variance as in Table V besides no social support. This plausibly happened due to higher level of literacy rate in young female population (15-24 years) i.e., 96.1% [30] as compared to Pakistani female youngsters (15-24 years) i.e., 67.5% [31]. As technology literacy is basic usage understanding of computer which each student in schools and colleges happen to know while being competent in this field is next step that depends on certain elements[32]. It also explains that the importance of technological learning behavior wouldn't be merely approved by social influence, but literate female usually self-realizes the prominence and value addition of digital competence for her career and personal life. Our research also explored that country with higher internet penetration results in positive behavior towards digital competence among females. The feeble part of social influence in Bangladesh results signals that higher literacy rate and proliferation of internet access could boost the digital competency. In returns this competence of technological expertise can provide higher level of entrepreneurial activities, skilled workforce, and qualified graduates. Startups and small IT businesses in developing countries are backed by higher level of technological expertise [33], [34].

Our study provides the insights into cognition mechanism of digital competence in females which was not addressed in previous studies. Role of gender towards assessing the digital competence among university students was discussed in

earlier studies [6], [7] which portrayed merely the scale of competency of using information technology tools. By depicting the role of predicaments towards female digital competence behavior, this research emerged as sole contributor and pioneer in the literature of digital skills and development in developing countries context. Likewise contemplating for United Nations SDGs, our study contributes to the gender equality goal in developing countries i.e., SDG5, by technological competence behavior assessment that will help to bring in the female youngsters in digital ecosystem and enable these to earn the benefits of technology. Females in Bangladesh and Pakistan have common standards of culture, social system, and religion therefore hypotheses results were orchestrated at almost parallel extent in both countries. However, due to disparity in literacy rate and internet access in both countries, novel inferences have been incurred such as social influence has no impact on behavior for being digital competent when literacy rate is higher and internet facilities are accessible.

The study findings can help the stakeholders to focus on enhancing the innovativeness level in academia towards digital transformation culture among young females. This would boost the numbers of females in tech industry. Beside this arranging the facilitating condition for digital competency by governments, NGOs, civil society, or wealthy countries in terms of mentorship programs, technological devices or digital setups would be helpful for women empowerment in digital economy. Societal influence and social support also accommodate the mindset towards digital competence eagerness. Initiating the tech-friendly programs and drafting the scenarios to create awareness for digital competence also fruitful. Social influence specifically works better towards digital competence behavior where literacy rate is comparatively lower and internet diffusion is of less scale.

Several limitations are noticeable in this study; thus, future work is recommended. For instance, the sample sizes might be extended covering more developing countries beyond the Bangladesh-Pakistan context, recognizing the cultural value differences that could influence the users' BI towards technology adoption in a digital learning platform. Obviously, such large sample sizes might derive the possibility to evidence the more generalizable outcome of the results. On the other hand, our study only examines three factors as predictor variables towards digital competence behavioral intention. Therefore, further study is recommended on different factors (i.e., digital literacy, compatible intentions, self-efficacy) to assess numerous behavior patterns.

#### REFERENCES

- [1] S. M. Hizam, H. Akter, I. Sentosa, and W. Ahmed, "Digital competency of educators in the virtual learning environment: a structural equation modeling analysis," in *IOP Conference Series: Earth and Environmental Science*, 2021, doi: 10.1088/1755-1315/704/1/012023.
- [2] BTRC, "Internet Subscribers in Bangladesh March, 2021 | BTRC," BTRC, Mar-2021. <http://www.btrc.gov.bd/content/internet-subscribers-bangladesh-march-2021> (accessed Jun. 15, 2021).
- [3] Pakistan Telecom Authorities, "Telecom Indicators in Pakistan| PTA," PTA, Mar-2021. <https://www.pta.gov.pk/en/telecom-indicators> (accessed Jun. 15, 2021).
- [4] W. Ahmed, S. M. Hizam, and I. Sentosa, "Digital dexterity: employee as consumer approach towards organizational success," *Hum. Resour. Dev. Int.*, pp. 1–11, Oct. 2020, doi: 10.1080/13678868.2020.1835107.
- [5] E. Sumuer, "Factors related to college students' self-directed learning with technology," *Australas. J. Educ. Technol.*, vol. 34, no. 4, pp. 29–43, Sep. 2018, doi: 10.14742/ajet.3142.
- [6] E. Vázquez-Cano, E. L. Meneses, and E. García-Garzón, "Differences in basic digital competences between male and female university students of Social Sciences in Spain," *Int. J. Educ. Technol. High. Educ.*, vol. 14, no. 1, p. 27, Dec. 2017, doi: 10.1186/s41239-017-0065-y.
- [7] R. Jiménez-Cortés, A. Vico-Bosch, and A. Rebollo-Catalán, "Female university student's ICT learning strategies and their influence on digital competence," *Int. J. Educ. Technol. High. Educ.*, vol. 14, no. 1, p. 10, Dec. 2017, doi: 10.1186/s41239-017-0040-7.
- [8] A. Khan, M. N. Masrek, and K. Mahmood, "The relationship of personal innovativeness, quality of digital resources and generic usability with users' satisfaction: A Pakistani perspective," *Digit. Libr. Perspect.*, vol. 35, no. 1, pp. 15–30, 2019, doi: 10.1108/DLP-12-2017-0046.
- [9] M. M. M. Abbad, "Using the UTAUT model to understand students' usage of e-learning systems in developing countries," *Educ. Inf. Technol.*, 2021, doi: 10.1007/s10639-021-10573-5.
- [10] M. B. Ali, T. Wood-Harper, and M. Mohamad, "Benefits and challenges of cloud computing adoption and usage in higher education: A systematic literature review," *Int. J. Enterp. Inf. Syst.*, vol. 14, no. 4, pp. 64–77, 2018, doi: 10.4018/IJEIS.2018010105.
- [11] R. Agarwal and J. Prasad, "A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology," *Inf. Syst. Res.*, vol. 9, no. 2, pp. 204–215, 1998, doi: 10.1287/isre.9.2.204.
- [12] K. P. Gupta, "Understanding learners' completion intention of massive open online courses (MOOCs): role of personality traits and personal innovativeness," *Int. J. Educ. Manag.*, vol. 35, no. 4, pp. 848–865, 2021, doi: 10.1108/IJEM-01-2020-0042.
- [13] W.-T. Wang and Y.-L. Lin, "The Relationships among Students' Personal Innovativeness, Compatibility, and Learning Performance: A Social Cognitive Theory Perspective," *Educ. Technol. Soc.*, vol. 24, no. 2, pp. 14–27, 2021.
- [14] D. J. Kelley *et al.*, "Global Entrepreneurship Monitor 2016 / 2017 Report on Women's Entrepreneurship," Wellesley, MA, 2017.
- [15] L. Foss, K. Woll, and M. Moilanen, "Creativity and implementations of new ideas: Do organisational structure, work environment and gender matter?," *Int. J. Gen. Entrep.*, vol. 5, no. 3, pp. 298–322, 2013, doi: 10.1108/IJGE-09-2012-0049.
- [16] G. A. Alsos, E. Ljunggren, and U. Hytti, "Gender and innovation: State of the art and a research agenda," *Int. J. Gen. Entrep.*, vol. 5, no. 3, pp. 236–256, 2013, doi: 10.1108/IJGE-06-2013-0049.
- [17] J. Cao, Y. Shang, Q. Mok, and I. K.-W. Lai, "The impact of personal innovativeness on the intention to use cloud classroom: An empirical study in China," in *Communications in Computer and Information Science*, vol. 1048, S. Cheung, J. Jiao, L. Lee, X. Zhang, K. Li, and Z. Zhan, Eds. Springer Singapore, 2019, pp. 179–188.
- [18] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User Acceptance of Information Technology: Toward a Unified View," *MIS Q.*, vol. 27, no. 3, pp. 425–478, 2003, [Online]. Available: <http://www.jstor.org/stable/30036540>.
- [19] E. Tan and asmine L. Lau, "Behavioural intention to adopt mobile banking among the millennial generation," *Young Consum.*, vol. 17, no. 1, pp. 18–33, 2016, doi: 10.1108/YC-07-2015-00537.
- [20] R. A. Bhimasta and B. Suprpto, "An Empirical Investigation of Student Adoption Model toward Mobile E-Textbook: UTAUT2 and TTF Model," in *Proceedings of the 2nd International Conference on Communication and Information Processing*, 2016, pp. 167–173, doi: 10.1145/3018009.3018046.
- [21] N. M. Suki and N. M. Suki, "Determining students' behavioural intention to use animation and storytelling applying the UTAUT model: The moderating roles of gender and experience level," *Int. J. Manag. Educ.*, vol. 15, no. 3, pp. 528–538, 2017, doi: 10.1016/j.ijme.2017.10.002.
- [22] M. Tsourela and M. Roumeliotis, "The moderating role of technology readiness, gender, and sex in consumer acceptance and actual use of Technology-based services," *J. High Technol. Manag. Res.*, vol. 26, no. 2, pp. 124–136, 2015, doi: 10.1016/j.hitech.2015.09.003.
- [23] S. Alkhasawneh and S. Alanazy, "Adopt ICT among Academic

- Staff in Aljouf University: Using UTAUT Model,” *Mediterr. J. Soc. Sci.*, vol. 6, no. 1, pp. 490–494, 2015, doi: 10.5901/mjss.2015.v6n1p490.
- [24] R. J. R. Yusof, A. Qazi, and I. Inayat, “Student real-time visualization system in classroom using RFID based on UTAUT model,” *Int. J. Inf. Learn. Technol.*, vol. 34, no. 3, pp. 274–288, 2017, doi: 10.1108/IJILT-03-2017-0018.
- [25] S. Lakhali and H. Khechine, “Technological factors of students’ persistence in online courses in higher education: The moderating role of gender, age and prior online course experience,” *Educ. Inf. Technol.*, pp. 1–27, 2021, doi: 10.1007/s10639-020-10407-w.
- [26] J. F. Hair, B. J. Babin, R. E. Anderson, and W. C. Black, *Multivariate Data Analysis*, 8th Editio. Cengage, 2018.
- [27] J. Henseler, C. M. Ringle, and M. Sarstedt, “A new criterion for assessing discriminant validity in variance-based structural equation modeling,” *J. Acad. Mark. Sci.*, vol. 43, no. 1, pp. 115–135, 2015, doi: 10.1007/s11747-014-0403-8.
- [28] M. Sarstedt, C. M. Ringle, and J. F. Hair, “Partial Least Squares Structural Equation Modeling,” in *Handbook of Market Research*, Cham: Springer International Publishing, 2017, pp. 1–40.
- [29] S. R. Chohan and Z. H. Akhter, “Electronic government services value creation from artificial intelligence: AI-based e-government services for Pakistan,” *Electron. Gov. an Int. J.*, vol. 17, no. 3, pp. 374–390, 2021.
- [30] UNESCO, “Bangladesh | UNESCO UIS,” *UNESCO*, 2019. <http://uis.unesco.org/en/country/bd> (accessed Jun. 15, 2021).
- [31] UNESCO, “Pakistan | UNESCO UIS,” *UNESCO*, 2017. <http://uis.unesco.org/en/country/pk> (accessed Jun. 15, 2021).
- [32] M. Spante, S. Sofkova Hashemi, M. Lundin, and A. Algers, “Digital competence and digital literacy in higher education research: Systematic review of concept use,” *Cogent Educ.*, Sep. 2018, doi: 10.1080/2331186X.2018.1519143.
- [33] R. Mancha and G. Shankaranarayanan, “Making a digital innovator: antecedents of innovativeness with digital technologies,” *Inf. Technol. People*, 2020, doi: 10.1108/ITP-12-2018-0577.
- [34] S. Baller, S. Dutta, and B. Lanvin, *The Global Information Technology Report 2016: Innovating in the Digital Economy*. 2016.