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Analyzing the correlation between gender variation and technology adaptation in language learning among foreign language students

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Abstract
The presence of technology in the domain of language education has proven to provide language learners with a plethora of opportunities to learn any language with ease. Language learners now use the technology of their choice to improve certain language skills. On the other hand, there are differences in the way male and female language learners use these technologies to achieve their required language learning goals. In this case, male language learners may choose a particular technology in language learning based on certain factors. This also applies to their female counterpart. The focus of this research anchors on analyzing this postulation in order to bring to the limelight the relevance of gender variation in technology adaptation in language education. Precisely, the objective of this research is to analyze the relationship between gender variation and technology adaptation in language learning among foreign language undergraduates. In the paper, a quantitative research methodology was adopted, wherein the research data were collated from a total number of three-hundred and ninety-four (394) foreign language undergraduates to achieve the objective of this research. However, relevant statistical measures such as CFA, descriptive statistics, and Pearson correlation were used to conduct proper analysis for the research. The results of the statistical analysis and the Pearson correlation test emphasize the critical role of gender in determining technology adaptation in language learning. Gender variation influences language learners' acceptance (mean score =4.10), use of technology (mean score = 3.50), and perceptions of the effectiveness of technology (mean score =2.80). Meanwhile, the research concludes that gender variation influences language users' acceptance of technology. However, when they accept it, there is a high tendency to use this technology in their language learning process and develop a positive perception of such technology.

Keyword: gender variation, technology adaption, language learning

1.0 Introduction

Among the innovative changes that have occurred over time in the domain of language education, technology integration has been assumed to wield more impact than others. This innovative change has influenced every part of language education, including language teaching and learning.

Nevertheless, with the use of technology, language students are presented with multiple and easy ways to learn a language of their choice. However, the presence of language teachers or the use of conventional classrooms is no longer necessary for students to practice and improve any of their language skills. Teachers, on the other hand, make use of technological tools to track the learning process of their students, alleviating some of the burdens in teaching by integrating technology into their teaching schemes, Kumar et al. (2021).

A closer look into the infusion of technology in the domain of language reveals variations in the ways language users adopt and utilize technological tools. However, a language learner might choose to use a particular technological tool based on certain factors such as educational background, gender difference, and cultural context. Based on this notion, Rubel et al. (2020) attested that users' adaptation to technology encompasses essential processes. Taherdoost (2018) identified recognition as the first process. However, when users recognize or are aware of the importance of technology, they are prompted to accept and use it.

As already stated before, different language users accept and use other technological tools based on various factors. Gender variation among these factors has been proven by many studies (Lenci, 2020; Yilmaz & Ünlü, 2022) to have a significant effect on language learners' adaptation to technology. According to Pokrivcakova (2019), many studies attested that female language learners have a greater tendency to demonstrate a more collaborative and communicative approach to the adaptation of technology compared to their male counterparts.

2.0 Review of Theoretical Framework and Related Literature

Several studies have explored gender variations in regard to the utilization of technological tools in language learning. Meanwhile, the majority of these works have focused explicitly on prevailing factors that prompt each gender to utilize a particular technology. However, reviewing these studies will aid in bringing to the limelight a better understanding of the objective of this study. This section is dedicated to reviewing these studies including the popular Technology Acceptance theoretical framework.

2.1 Technology Acceptance Model

As a relevant theoretical framework in the domain of language education, the Technology Acceptance Model (TAM) has been regarded as a rudimentary method for determining the acceptance and use of technology. A critical look into the concept of 'TAM' highlights why some people find the use of technology easy and why some find it hard.

Tracing the origin of TAM, Masrom (2007) claimed that the theoretical framework was developed by Fred Davis in 1989. However, the Theory was primarily hinged on the Theory of reasoned action (TRA). By TRA, individuals' behaviors toward certain things are explained based on attitude, social norms, and intention. As a behavioral theory in the field of psychology, Holden & Karsh (2010) maintained that this Theory helps to understand individuals' reasons for certain behaviors.

On the other hand, the primary objective of the TAM framework is to reveal the motivation behind users' utilization of technology. According to Kashefi et al. (2015), this model emphasized on user-centered approach to accepting and using technological tools. In the words of Silva (2015), users' attitudes towards a technological tool can be traced using the TAM framework. However, this is achieved

by first understanding users' intentions. A more profound approach to understanding the concept of TAM was provided by Robert (2021). The scholarly work claimed that the model provides practitioners with relevant insights into the actions they need to carry out before implementing technology. In this vein, Davies and Venkatesh (1995) argued that a series of actions must be undertaken in order to achieve the goals set out by the framework. However, this was illustrated by Masrom (2007) which is presented below.
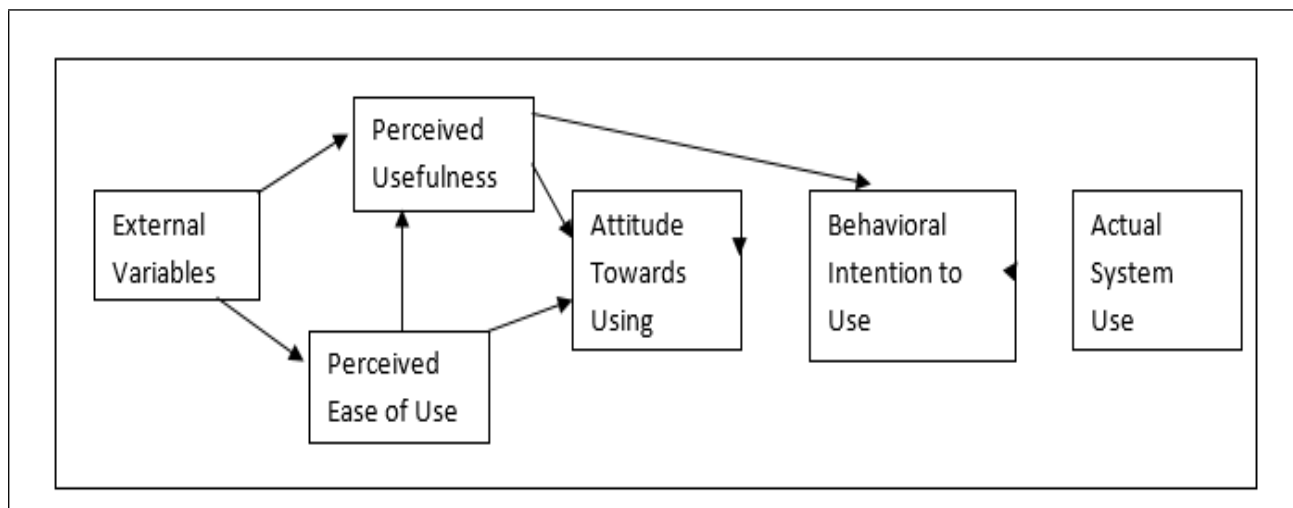

Fig. 1. Representation of Technology Acceptance Model

The above presentation of TAM reveals that this framework mediates the connection between external elements, such as the qualities of information systems, and the actual use of these systems. With the external variables in view, users of technology are firstly influenced by factors outside of their internal cognition that influence their decisions and perceptions. Bhattacherjee and Harris (2009) maintained that factors such as information quality, service quality, and social influence, amongst others, can influence users' decision to accept or reject using technology.

Meanwhile, investigation from several studies (Robert, 2021; Amin et al., 2014; Sugandini et al., 2018; Hwa et al., 2015; Gefen & Straub, 2000) have acknowledged perceived utility (PU) and perceived ease of use (PEOU) as two fundamental ideas that influence the TAM framework. Perceived Usefulness is identified as users' perception of the degree to which the utilization of technology would improve their work performance, while Perceived Ease of Use emphasizes users' subjective evaluation of the level of user-friendliness shown by a given technology. This however, shows that there is a higher likelihood of acceptance and integration of technology by users if these technologies prove user-friendly.

A.   Perceived Usefulness (PU)

As stated before, users understand that using a particular technology will enhance their performance or productivity, and this is made possible by external variables. In the words of Davis (1989), PU is an essential factor that determines whether users can accept or reject new technology. In order words, there is a tendency to accept a technology if the user perceives that it can facilitate the accomplishment of a specific goal. In this vein, Al-Al-Mamary (2022) claimed that PU serves as a predictor of users' positive perceptions of the use of technological tools. Nevertheless, these positive perceptions enhance intentional attitudes toward the use of technology for optimal work performance.

B.   Perceived Ease of Use (PEOU)

In regards to PEOU, Hwa et al. (2015) argued that this factor determines how continent users find the

utilization of technology. According to Binyamin et al. (2019), some elements found in these technologies, such as interface design, technical compatibility, and support resources, amongst others, can influence users' perceived ease of use. Meanwhile, Binyamin et al. (2019) acknowledged the interconnectivity of PU and PEOU. The scholarly work attested that users are encouraged to use a system if they perceive that it is valuable and easy to use.

C.   **Attitudes towards using**

Attitudes towards the use of technology spur from users' perceptions. Hence, users are more likely to have a positive attitude towards technology if they have good perceptions of the given technology and vice versa.

D.   **Behavioral Intention and Actual System Usage (AU)**

Works of some scholars (Ibrahim et al., 2017; Abu-Dalbouh, 2013; and Robert, 2021) identified Behavioral intention (BI) and Actual System Usage (AU) as other relevant components of the TAM framework. Abu-Dalbouh (2013) noted that BI unveils users' preparedness to use technology. However, this phenomenon is primarily impacted by users' perception of utility and the perception of ease of use. In regards to AU, Ibrahim et al. (2017) claimed that this component reflects real-world adoption of technology.

2.2   Exploring Gender Variation in Technology Use in Language Education

Over the years, gender variation has been assumed to be one of the factors that influence the use of technology, specifically in the domain of language education. As a relevant concept in the domain of language education, gender variation includes general perceptions and attitudes among males and females towards a particular system. A closer look at the history of the concept in the domain of education unveils a long-run argument over the years by scholars. However, this argument has lingered over the years as many scholars seek to unveil the reason behind the influence gender has on the utilization of technological tools in language settings.

Although there was not much emphasis on gender in the early studies (Warschauer, 1999; Anderson, 1991; Blake, 1995) on the emergence of technology in the language domain, with the immense impacts of technology in every area of language education, scholarly works like, (Wang et al., 2019; Huffaker & Calvert, 2005; Yilmaz & Ünlü, (2022), and Al-Fahad 2009) provided insight into gender variation and its influence on technology use in the field of language education.

In regards to adaption to technology in language learning, Yilmaz & Ünlü 2022 maintained that perceptions and preferences are the main instigators of gender variation. In other words, the choice of technology utilization, especially language learning apps and voice-controlled digital assistants for language-related activities, may be determined by gender-based preference. While males demonstrate a dominant preference for employing voice-controlled digital assistants, females are largely inclined towards using language learning apps, Yilmaz & Ünlü 2022. Also, Pokrivcakova (2019) revealed that many studies attested that female language learners have a greater tendency to demonstrate a more collaborative and communicative approach to the adaptation of technology compared to their male

counterparts.

A renowned work of Brown et al. (2010) highlighted how stereotypes about technical ability and interests among both genders instigate gender variation in technology usage. Nevertheless, the scholarly work noted that societal norms have allocated diverse roles expected among both genders in regard to technology adaptation. This prevailing norm cuts across several societies such that globally, there is a promotion of men's engagement in technology-oriented professions and pursuits, such as computer programming or engineering, more than women, Brown et al. (2010). Another societal stereotype in technology usage, as identified by Al-Fahad (2009), is the notion that males possess an inherent aptitude for technology and a predisposition towards STEM disciplines, such as mathematics, science, technology, and engineering, while females are often portrayed as being less oriented towards technology.

3.0   Study Methodology
3.1   Study Design
The current employed the use of a quantitative research methodology. As a rightful methodology for this research, the quantitative method is a research approach that hinges on the collation of significant and relevant data with the intention of analyzing them to support an existing postulation. More so, a Correlational Study (Pearson correlation) was utilized in this research. The essence of integrating a Correlational Study is to examine the statistical correlation that exists between gender variation and technology adaptation.

3.2   Research Questions
The following research questions, which were anchored on the main objective of this study, were developed and listed thus;

1.   How does gender variation influence the acceptance of technology among foreign language students?
2.   To what extent does gender variation influence the use of technology among foreign language students?
3.   What role does gender variation play in shaping the effectiveness of language learning technology?

3.3   Survey Hypothesis
The hypotheses that were tested in this research were as follows:

a.   There is a correlation between gender variation and technology acceptance.
b.   There is a correlation between gender variation and technology use.
c.   There is a correlation between gender variation and technology effectiveness.

3.4   Study Sample
The study population for this research includes 400 foreign language students. However, these students were randomly selected from different relevant universities. Goggle forms, which include the research questionnaires, were developed and administered to these students through emails to collate relevant

data for the research. It is important to note that only 394 students were able to answer the survey items. Also, the participants provided their demographic information, which is summarized and presented in the table below.

Table 1: Demographic Variable

Category	Variable	Percentage
Gender	Female	58.81%
	Male	41.19%
Age	19 years below	30.54%
	20-25 years	63.96%
	26 years above	5.50%
Academic Level	Finals	70.91%
	Other levels	29.09%

The table above summarizes relevant demographic information as provided by the research participants. It can be seen from the survey result that female participants dominated the study population, wherein over 58% are female participants compared to their male counterparts. Also, about 30.54% of the participants are 19 years or less, 63.96% are between 20 and 25, and only 5.50% are 26 years and above. This age variability is indicative of the fact that the study population is mainly younger people who are generally known to be active users of technological devices and systems. Lastly, the result from the table further indicates that most of the respondents are in their final year, at over 69%, while the remaining populations are in other levels, including those in their penultimate level.

3.5 Study Tools

This study used a data collection technique known as a questionnaire. According to Roopa & Rani (2012), a questionnaire is defined as questions intentionally developed and designed for respondents to offer their opinions. Meanwhile, the research questionnaire was designed using a 5-point Likert scale format, such that respondents are only required to either accept or reject the statements provided. Nevertheless, a total of 10 measuring items were also developed.

3.6 Method of Analysis

The study further applied Confirmatory factor analysis (CFA) in order to evaluate and organize the developed items into constructs. This approach facilitates validation of the measuring reliability of the developed items. Nevertheless, the 10 survey items were anchored on three critical factors. While Factor 1 represents gender variation (GVT) and technology acceptance, the second factor represents gender variation and technology use, while the last factor represents gender variation and technology effectiveness. More so, SPSS was used to carry out a descriptive statistics analysis, and the Pearson Correlation Coefficient was further used to test the research's hypothesis.

4.0 Result and Discussion

The table below represents the results of the collected. However, the table contains the computed responses of both the male and female respondents.

Table 2: Descriptive Statistics for Male Participants

Factors	Items	Range	Mean (Male)	Mean (Female)	Std. (Male)	Std. (Female)
Gender variation and technology acceptance GVT-A 1-3	- I find it easy to accept new technology. - I have positive attitude towards technology. - I feel confident using technology to learn language.	3	3.75	3.58	1.15	1.09
		3	4.12	4.28	0.98	0.92
		3	4.15	3.98	1.06	0.99

Gender variation and technology use	- I constantly use technology in language learning.	3	4.38	4.26	0.89	0.85
GVT-U 1-3	- I enjoy using technology for language learning.					
	- I prefer gaming than collaborative technology for language learning.	3	4.05	4.12	1.01	0.97
		3	4.37	3.35	1.12	1.07

Gender variation and technology effectiveness GVT-E 1-4	- I learn faster while using technology.	4	3.77	3.85	1.09	1.04
	- My language skills are improved when I use technology in learning	4	4.18	4.12	0.97	0.93
	- I accomplish my language learning goals using technology.					
	- Technology enhances my communication skill.	4	4.25	4.18	0.95	0.91
	.					
		4	3.03	4.05	1.03	0.98

Based on the GVT-A 1-3 factor represented in the above table, it can be seen that there is apparent gender variation in regard to technology use among the participants. The means scores of the first item reveal that male respondents find it relatively easy to accept new technology. Although the mean score of the female, which is 3.58, suggests that female respondents also find it easy to accept new tech technology, there is a slight difference in terms of their responses compared to the males. Also, in regards to positive attitudes toward technology, the female respondents have stronger positive attitudes compared to their male counterparts. Meanwhile, there is a low level of variability in responses of both genders, suggesting consistent agreement on the second item. In terms of confidence in the use of technology, the mean score of the male respondents (4.15) reveals that males feel more confident in using technology compared to their female counterparts. Also, there is a moderate variability in the responses of the participants which suggests a consensus among them in regards to gender variation in regards to confidence in using technology.

The GVT-U 1-3 represents gender variation and technology use. Based on the survey items present in this second item, it can be seen that there is not much gender variation in the responses of the participants. In terms of usage, both genders attested that they use technology in language learning. This can be seen from the mean scores of the males and females in the fourth and fifth items. Although the mean score is not the same, there is low variability in their responses, indicating more substantial consensus among both genders in regard to constant use and enjoyment of the use of technology. Furthermore, there is observable gender variation in regard to the responses of the participants in terms of the technology they prefer to use. The male respondents have a stronger preference for gaming technology than collaborative technology for language learning. This can be shown in the mean score (4.37) presented in the table above. However, the response from the female participants shows a low

preference for gaming technology for language learning, with a 3.35 mean score.

Finally, the GVT-E 1-4 represents gender variation and technology effectiveness. While there seems to be apparent gender variation in regards to acceptance and usage of technology as indicated by GVT-A 1-3 and GVT-U 1-3, there are lesser variations in regards to the opinions of the male and female research participants in regards to the effectiveness of technology in language learning. However, both genders acknowledged that technology facilitates the learning process, improvement of their language skills, and accomplishment of the language learning goals. In terms of enhancement of their communication skills, the female gender attested that technology enhances their communication skills compared to their male counterpart. This can be seen in their various mean scores (3.03 and 4.05, respectively).

b. Factor Analysis for validating the measuring items

As already stated in the research, the use of Confirmatory Factor Analysis (CFA) would be further employed to analyze the selected 10 measuring items. This approach is essential in order to validate the validity of the selected measuring items. More so, the CFA approach also gives relevant insight into the interrelation between the indicators or measuring items.

Table 3: Factor Analysis of the Indicators

Factors	Indicators	Factor 1	Factor 2	Factor 3
Gender Variation and Technology Acceptance: GVT-A 1-3	GVT-A 1	0.857	0.103	-0.0.68
	GVT-A 2	0.605	0.034	0.294
	GVT-A 3	0.598	0.038	0.025
Gender Variation and Technology Use: GVT-U 1-3	GVT-U 1	0.308	0.832	0.158
	GVT-U 2	0.115	0.721	-0.016
	GVT-U 3	0.149	0.651	0.091
Gender Variation and Technology Effectiveness: GVT-E 1-4	GVT-E 1	0.027	0.282	0.605
	GVT-E 2	0.282	0.131	0.526
	GVT-E 3	0.131	0.027	0.864
	GVT-E 4	0.081	0.102	0.582

The above table represents a factor analysis that measures the selected items developed for this research. However, this analysis also aligns with the TAM framework, which anchors on three key components, including perceived usefulness, perceived ease of use, and other relevant factors that influence technology adaptation. In the context of the TAM framework, the factor loading present in the table above shows that the correlation between every item and the extracted factors is significant, as it could help us see how these items group together and may also reveal new scope in the data.

Meanwhile, loadings of the "GVT-A" items (measuring gender variation and technology acceptance) are high on Factor 1 (ranging from 0.526 to 0.857). However, it reveals that these items are highly similar, possibly representing the most important factors underlying the use of technology by students. In the context of the TAM framework, these items can be said to represent perceived usefulness

(PU). On the other hand, the item loadings for the items on Factor 2 and Factor 3 are moderately substantial, suggesting a moderate influence on Factor 1.

Furthermore, in "GVT-U" items (measuring use), a clear trend emerges. Here, the factor loadings are high (from 0.651 to 0.832) on Factor 2, moderately low on Factor 2, and deficient on Factor 3. This suggests that these items have a solid general theme, which is perceived ease of use (in the context of the TAM framework). Nevertheless, this also suggests that Factor 1 affects Factor 2 more than Factor 3. On the other hand, GVT-E items (measuring gender variation and technology effectiveness) represent a common theme in the context of the TAM framework. This theme includes various external variables that influence technology adoption. Nevertheless, it can be seen that factor loadings were highest on Factor 3 (ranging from 0.526 to 0.864), and there were moderate loadings on Factor 2 (ranging from 0.027 to 0.282).

d.   Test of Hypothesis

Table 4: Pearson Correlation Coefficient between Gender Variation and Technology Acceptance, Use and Effectiveness

Variable	Mean	Std.	Pearson Correlation	p-value	Coefficient of Determination (R^2)
Hypothesis 1	4.10	0.80	0.52	<0.001	0.027
Hypothesis 2	3.50	0.75	0.45	<0.01	0.20
Hypothesis 3	2.80	0.60	0.37	<0.05	0.15

After analyzing the generated data based on gender variation and technology acceptance, use, and effectiveness, Pearson Correlation analysis was further used to test the research hypotheses (using the Pearson Correlation coefficient to calculate each hypothesis). However, the research shows that there is a moderate positive correlation between gender variation and technology acceptance. This can be seen from the Pearson correlation coefficient, which is 0.52, and the p-value of < 0.001). In other words, as gender variation increases, there is a high chance of acceptance of technology. On the other hand, the coefficient of determination, which is 0.027, suggests that technology acceptance can be influenced by gender variation. In the second hypothesis, the result, as shown in the table above, suggests a moderate positive correlation between gender variation and technology use, which is shown in both the mean score and standard deviation.

Nevertheless, the Pearson correlation coefficient, which is 0.45, p-value < 0.01, illustrates that the more the presence of gender variation, the higher the tendency of technology use among the respondents. More so, the coefficient of determination (R-squared = 0.20) signifies that roughly 20% of the difference in the use of technology can be attributed to gender variation. The findings further emphasize the critical role of gender in determining technology adaptation in language use. Finally, the result from the third hypothesis highlights a moderate positive correlation between gender variation and technology use (Pearson correlation coefficient = 0.37, p-value < 0.05), suggesting that statistically, there is a significant correlation supporting the notion that gender influences language learners' perceptions of technology effectiveness.

4.1   Discussion

The central argument in this research is that there is a correlation between gender variation and technology adaptation among foreign language learners. Technology adaptation unveils a vital process that enables language students to use technology, especially new ones, at ease. According to Rubel et al. (2020), users' adaptation of technology encompasses essential processes, which include acceptance and usage of technology.

However, there is the assumption that this research aimed to clarify, which suggests that gender influences language learners' adaptation to technology. A thorough analysis was conducted, which involved the use of descriptive statistics, CFA, and Pearson correlation tests to determine whether to accept or reject the proposed hypotheses for the research. However, the data for the research was generated through administering of questionnaire to the research participants. The responses from these participants formed the basis of the data used for the research. Additionally, the data analysis was targeted at answering the three primary research questions; which include 'How does gender variation influence the acceptance of technology among foreign language students, to what extent does gender variation influence the use of technology among foreign language students, and what role does gender variation play in shaping the effectiveness of language learning technology.

The results from the research reveal that gender variation influences the acceptance of technology among foreign language students. This can be seen from the responses of the participants in the first to third survey items. However, there were positive responses from the participants that they find it easy to accept new technology, have a positive attitude towards technology, and feel confident in using technology to learn language. However, there was slight variation among the responses of both female and male respondents in regard to technology acceptance. Based on the participant's responses, male respondents find it relatively easier to accept new technology than females. Also, in regards to positive attitudes toward technology, the female respondents have stronger positive attitudes compared to their male counterparts. In terms of being confident in using technology, they male respondents exhibit a stronger opinion than the female. Meanwhile, this variability can be traced to societal stereotypes that put me in a position that is better at interacting with technology than the female, Al-Fahad (2009). Additionally, the European Institute for Gender Equality (2020) further postulates that females exhibit a higher level of anxiety while using technology and also have more unfavorable sentiments towards digital technology than males.

Meanwhile, the results from the second research question reveal that there is not much gender variation in the responses of the participants in terms of technology usage. However, both genders attested that they use technology in language learning. Despite lesser gender variation in technology usage, another relevant finding in the sixth survey item reveals that there is gender disparity in terms of the type of technology in use. The result shows that male respondents are more inclined to use gaming technology in language learning than their female counterparts. As attested by Bonanno*& Kommers (2005), male students "have an advantage in visuospatial reasoning, being more adept at performing disembodying and internal spatial transformations, though allowing them to perform better in the use

of video games than the females.

Based on the third research question, the result shows that there is less gender variation in regard to technology effectiveness. While there seems to be apparent gender variation in regards to acceptance and usage of technology as indicated by GVT-A 1-3 and GVT-U 1-3, there are lesser variations in regards to the opinions of the male and female research participants in regards to the effectiveness of technology in language learning. However, both genders acknowledged that technology facilitates the learning process, improvement of their language skills, and accomplishment of the language learning goals.

Obviously, the three research questions also reflected the three hypotheses developed by this study, which include there is a correlation between gender variation and technology acceptance, there is a correlation between gender variation and technology use, and there is a correlation between gender variation and technology effectiveness. However, these hypotheses were further tested using Pearson Correlation analysis. However, the research shows that there is a moderate positive correlation between gender variation and technology acceptance, use, and effectiveness.

Generally, gender influences technology adaptation. Based on the TAM framework, gender as an external factor influences technology adaptation. In other words, individuals may choose to accept and use a particular technology because of gender-based factors. On the other hand, both males and females also have diverse opinions in regard to how technology improves a particular language skill. This can be seen in the 10th survey item of this research, which reveals that female respondents were of stronger opinion that technology enhances their communication skills than their male counterparts.

5.0   Conclusion

Technology adaptation involves the process of adapting to a technology. However, this adaptation starts form first accepting the technology. According to the TAM framework, external factors such as information quality, service quality, and social influence, amongst others. Gender variation is one of the external factors that influence technology adaptation. For instance, male language students may choose to accept and use a particular technology because of domineering preference among the male gender. As revealed in this research, male respondents attested to preferring gaming technology to learn language as opposed to their female counterparts. Conclusively, the research was able to accept the three proposed hypotheses developed, indicating that there is indeed a relevant relationship between gender variation and technology adaptation.

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