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Teachers' trainers' intention and motivation to transfer ICT training: The role of ICT individual factors, gender, and ICT self-efficacy

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Abstract
Important variables related to transfer information & communication technologies (ICT) training include the individual's perceived motivation to learn, motivation to transfer, and intention to transfer the ICT training. Most previous studies investigate the transfer of ICT training and its application in the daily teaching practice by ordinary teachers, usually neglecting the important population of the teachers' trainers. These teachers' trainers receive advanced ICT training before start training their colleagues. Therefore, the main purpose of this study is to investigate the teachers' trainers' transfer of ICT training analyzing the structural relationships of their afore-mentioned variables with their gender, ICT self-efficacy, and a set of ICT individual factors. The study employed structural equation modeling using data collected from 117 teachers' trainers in primary and secondary education who participated in a national ICT Transfer Training Programme for teachers' trainers in Greece. The results reveal strong associations between ICT-related self-efficacy and transfer training measures. Both gender and ICT factors cause significant differences in the levels of their ICT self-efficacy measures. ICT expertise and gender highlight significant relationship paths in the model, while gender seems to play a moderating role as well.

Keywords: Gender in Transfer ICT Training; ICT Self-Efficacy; ICT Training of Teachers' Trainers; Integrating ICT in Education; Intention to Transfer

1. Introduction

Teachers' training programmes can only be considered as effective if the teachers successfully transfer the gained knowledge in the daily teaching practice. Popular studies

on transfer training models (e.g., Binkhorst et al., 2015; Helmke, 2014; Lipowsky, 2010; Lee et al., 2014) are mainly concerned with three basic transfer training constructs, namely motivation to learn, motivation to transfer, and intention to transfer or training outcome. The inclusion of self-efficacy in the structural models roots at the social cognitive perspective of Bandura (1986) explaining that transfer and learning outcomes are determined by cognition (Gibson, 2004; Swanson, 2001). Also, gender differences in teachers' beliefs may determine the teachers' intention to use and apply ICT into classrooms. As a fact, several studies have identified gender differences in computer-related constructs both for teachers and students (Ong & Lai, 2006; Scherer & Siddiq, 2015; Teo, 2014; Tondeur et al., 2008). In addition to examining direct effects, it is very important to also examine the complex relationships between variables such as mediating or moderating effects (Fassot et al., 2016). However, there are very few studies examining this kind of relationships in the context of ICT transfer training.

Although previous researchers have deeply examined the relationships between self-efficacy and transfer training variables, as well as the role of gender and other individual factors on transfer training variables, these efforts have been mainly traced either in non ICT training programmes or out of the transfer training context. Hence, further studies are still needed to elucidate the multi-lateral relations in afore mentioned ICT transfer training constructs for teachers' trainers. Also, most previous studies investigate the usual teachers' transfer of ICT training and its application in the daily teaching practice, usually neglecting the population of the teachers' trainers who are also trained in order to subsequently train their colleagues. Of course, these teachers' trainers receive more advanced ICT training than the usual teachers. These teachers' trainers will transfer their ICT training to mainly train their colleagues (acting as the trainers in future ICT training programmes) who will then teach their own students. The analysis of their characteristics is of high importance due to their direct impact of transfer training on usual teachers.

To fill the above-mentioned research gap, this study assumes that transfer of ICT training models might shed light on differentiated relationships not only between the three main transfer training constructs but also on the direct and indirect effects of pre and post ICT-related self-efficacy as well as the structural effects of gender and ICT-related individual factors. Extending the current theoretical models, this study investigates how both pre- and post-training ICT-related self-efficacy predict training transfer, and the mediating role of ICT motivation to learn or transfer ICT knowledge and skills to teachers in primary and secondary education. Also, this research suggests the examination of the moderating role of gender and ICT individual factors like ICT-based teaching experience and ICT expertise on the ICT transfer training variables, as well as their final impact on teachers' intention to transfer and apply ICT knowledge and skills in teaching practice.

This work seeks to contribute in the research efforts toward the design of effective teachers' trainers' transfer training programs for efficiently transferring and integrating ICT skills and knowledge in education. These teachers' trainers will train other teachers in integrating ICT in education. The study results shed light on the critical role of gender and ICT-related variables for teachers' trainers' motivation and intention to transfer ICT knowledge and skills. The findings suggest that teacher training institutions and ICT

transfer training program designers should consider the participants' cognitive and individual factors to assist them on efficiently transferring the training outcomes.

2. Research objectives and hypotheses

Overall, the main research objectives of the current study are as follows:

RO1: To examine the direct and indirect effects of pre- and post-training ICT self-efficacy on intention to transfer ICT skills and knowledge of teachers' trainers.

RO2: To investigate the relationships and moderating effects of teachers' trainers' gender and ICT individual factors on the transfer training latent variables.

RO3: To examine potential differences in the ICT transfer training variables cross different groups of teachers' trainers based on their gender and ICT individual factors.

To explore the above defined research objectives a structural model is composed to represent the relationships between the main latent variables.

Next, we present the relevant literature background for each one of the integrated constructs, to conclude on a set of research hypotheses.

Motivation to Learn (ML) is defined as the internal desire of the trainee to learn the content of the training program (Noe, 1986). Also, **Motivation to Transfer (MT)** is defined as the internal desire of the trainee to transfer what he/she learnt in the training program (Gegenfurtner et al., 2009). Several researchers have concluded that MT is essential for training transfer (Burke & Hutchins, 2007; Pugh & Bergin, 2006) also highlighting its mediating role in transfer training outcome. Furthermore, ICT integration is affected by ICT-related motivation (Sang et al., 2011).

Intention to Transfer (IT) roots on the Theory of Planned Behavior -TBM (Ajzen, 1991) which perceives intention as a direct antecedent of actual behavior. Intention is defined as the trainee's desire, sense of responsibility and self-prediction. As suggested by Yelon et al. (2004) a critical stage in the transfer process is the intention to use what was learned and hence IT is a vital part of the application process.

Researchers have mainly examined MT as an outcome variable influenced by ML and self-efficacy (Kontoghiorghes, 2002) but also as a positive predictor of transfer training (e.g., Axtell et al., 1997; Lee et al., 2014). Several studies have identified a link between ML and MT (e.g., Chiaburu & Lindsay, 2008; Rowold, 2007) concluding that ML tends to predict MT (e.g., Bell & Ford, 2007; Chiaburu & Lindsay, 2008). Furthermore, several studies have proved the correlation between pre-training trainees' self-efficacy and ML (Lee et al., 2014).

Moreira-Fontan et al. (2019) link the term **ICT self-efficacy for teaching** (Scherer & Siddiq, 2015) to the set of skills related to the knowledge of new digital technologies and their application in classroom activities. Persons with higher self-efficacy set more challenging goals for themselves than do persons with lower self-efficacy (Bandura, 1986). In the context of teaching, Kassis et al. (2019) conclude that teachers with higher self-efficacy also have higher levels of autonomy and competence.

ICT-related self-efficacy has also been studied in several research works (e.g., Hatlevik & Hatlevik, 2018; Moreira-Fontán et al., 2019; Scherer & Siddiq, 2015) to determine teachers' emotions and motivation to use or exploit ICT in the classroom. Several studyis have also confirmed the relationship between self-efficacy and training outcomes. For instance, Chiaburu and Lindsay (2008) highlight the relationships between self-efficacy and both ML and MT. Recently, Alt (2018) showed via a PLS-SEM methodology that teachers' sense of efficacy and ICT efficacy are related to teachers' tendency to apply ICT practices in their classrooms.

The current research work, distinguishes two measures of training transfer ICT self-efficacy: pre-training and post-training self-efficacy, expecting specific relationship paths towards the transfer training variables of ML, MT, and IT the ICT knowledge and skills.

i) Pre-training and domain specific self-efficacy reflects the trainee's personal attitude in terms of confidence on their job performance. To this end, **ICT Teaching Self-Efficacy (ICT-TSE)** refers to the beliefs that teachers hold about their instructional capabilities (Morris, 2017). This kind of self-efficacy is shown to be positively related to instructional quality (Burić & Kim, 2020) and tends to show a positive association to training transfer (Blume et al., 2010).

ii) Post-training Self-efficacy, i.e. **Self-Efficacy to Transfer (SET)**, reflects the trainee's perception of his/her ability to successfully transfer the gained knowledge. Post-training self-efficacy has been shown to positively affect both MT and IT (Al-Swidi & Yahya, 2017; Lee et al., 2014). The relationship between post-training self-efficacy transfer training variables has been addressed by many researchers; findings reveal that self-efficacy maximizes motivation to transfer, training transfer (Chiaburu et al., 2010; Simosi, 2012; Tziner et al., 2007; Velada et al., 2007), and intention to transfer (Al-Swidi & Al Yahya, 2017; Blume at al. 2010, Mullins et al., 1998).

Personal characteristics like **teachers' ICT expertise (ICT-Exp)** and **ICT teaching experience (ICT-Teach)** have shown significant relationships with transfer training variables. Research results indicate that computer-based experience has significant effects on ICT-related self-efficacy (e.g., Hassan, 2003). Teachers' computer experience relates positively towards integrating computers in the classroom (van Braak et al., 2004). Similarly, teaching experience has also been showed to influence the successful use of ICT in classrooms (Wong & Li, 2008).

Gender has been broadly studied in the fields of Human-Computer Interaction and ICT education; however, the 'gender gap in computing' (EC, 2019) seems to refer solely to the pre-training computer skills where women tend to report lower levels of computer use and interest (Kay, 2006; Norris et al., 2003). Researches (Al-Swidi & Al Yahya, 2017) confirm a set of gender-related differences in transfer training constructs. Some works produce differentiated results showing no significant gender differences for ICT self-efficacy in using computers for instructional tasks (Scherer & Siddiq, 2015). In a recent study, Tondeur et al. (2018) explore the impact of pre-service teachers' individual characteristics (age and gender) and ICT characteristics (e.g., attitude towards ICT) on their ICT competencies. Some studies however (Lauermann & König, 2016; Scherer & Siddiq, 2015) did not find any significant gender-based differences in teachers' ICT self-efficacy levels.

Due to the ICT orientation of the current study, all constructs are named using the prefix "ICT-" to distinguish them from relevant constructs measured in previous studies outside of the ICT transfer training context. Overall, based on the above literature background and the challenge driven by the ICT research gap, this research seeks to examine the following ICT-related variables:

- **ICT Motivation to Learn (ICT-ML):** Motivation to learn how to integrate digital technologies in Education.
- **ICT Motivation to Transfer (ICT-MT):** Motivation to transfer the digital training on integrating digital technologies in Education.
- **ICT Intention to Transfer (ICT-IT):** Intention transfer the digital training on integrating digital technologies in Education.
- **ICT Self-Efficacy to Transfer (ICT-SET):** Self-Efficacy to transfer the digital training on integrating digital technologies in Education.
- **ICT Teaching Self-Efficacy (ICT-TSE):** Self-Efficacy on teaching ICT-related courses.

In line with previous research and the examined ICT variables, our model on teachers' trainer' transfer of ICT training proposes the following hypotheses:

H1: *ICT motivation to learn positively affects ICT intention to transfer.*
H2: *ICT motivation to learn positively affects ICT motivation to transfer.*
H3: *ICT motivation to transfer positively affects ICT intention to transfer.*
H4: *ICT teaching self-efficacy positively affects ICT motivation to learn.*
H5: *ICT motivation to learn positively affects Self-Efficacy to transfer.*
H6: *Self-efficacy to transfer positively affects ICT motivation to transfer.*
H7: *Self-efficacy to transfer positively affects ICT intention to transfer.*
H8: *Gender affects ICT intention to transfer.*
H9: *Gender affects ICT self-efficacy to transfer.*
H10: *ICT expertise affects ICT intention to transfer.*
H11: *ICT expertise positively affects ICT self-efficacy to transfer.*
H12: *ICT teaching experience positively affects ICT intention to transfer.*

Figure 1 shows the ICT Transfer Training model developed by drawing on the literature review. In this model a set of individual pre- and post-training ICT self-efficacy measures, teachers' trainers' individual factors (gender, teaching experience, ICT expertise) and popular transfer training variables (motivation to learn, motivation to transfer) are examined in terms of their correlations and their final impact on the teachers' trainers' intention to transfer ICT knowledge and skills in education. The examined constructs of transfer training (motivation, intention) and self-efficacy are shown inside the rectangle areas, while the individual-level constructs of gender, ICT expertise and ICT-based

teaching experience are shown in ellipses. The categories of the constructs (i.e., pre and post self-efficacy measures, individual measures and ICT transfer training measures) are also shown inside dotted ellipses. Finally, each arrow represents the direction of the examined relation between the constructs according to the defined hypotheses (H1 to H12).

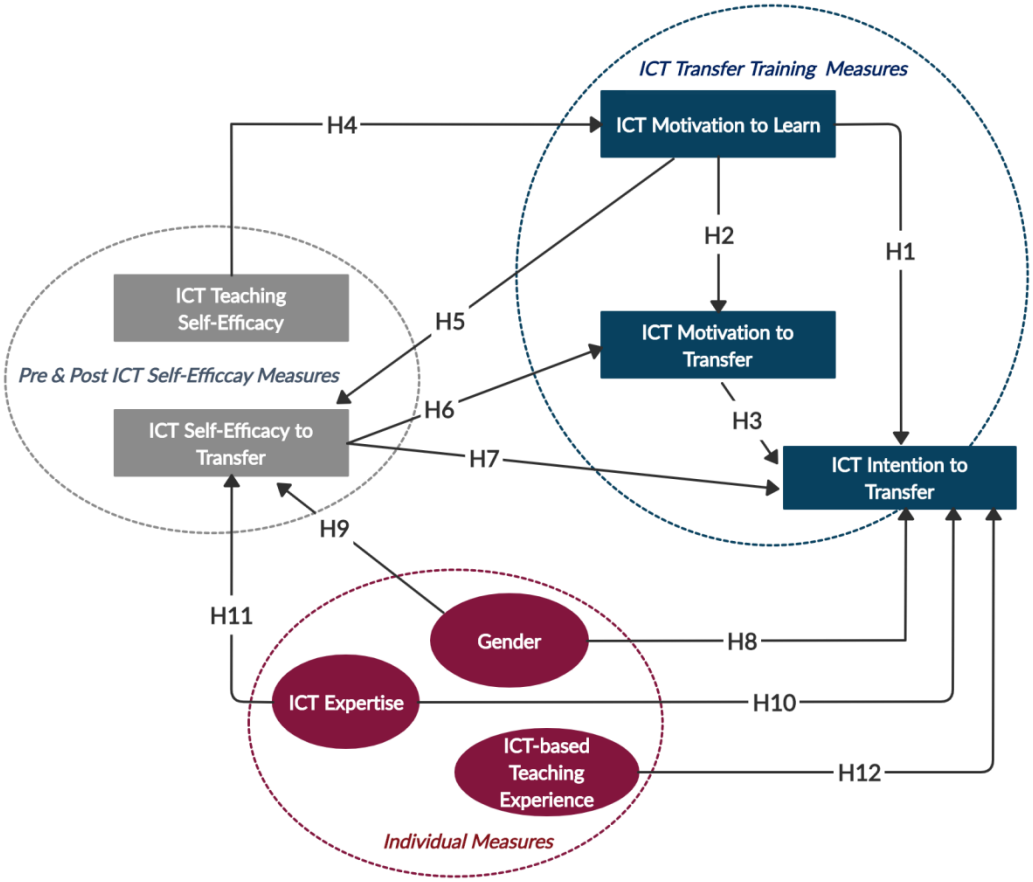

Figure 1 ICT Transfer Training Research Model

Previous research has also revealed significant moderating effects of gender and other individual factors on perceived variables like self-efficacy (e.g., Keshavarz & Baharudin, 2012) or satisfaction (e.g., Zhou et al., 2014) in several research fields.

By assuming that personal (individual) characteristics like gender and experience affect the transfer training variables, this study also aims to examine their mediator role in a set of basic relationships between self-efficacy and transfer related variables. To this end, Figure 2 shows the conceptual model of the examined moderating relationships caused by the individual factors of gender, ICT teaching experience, and ICT expertise level.

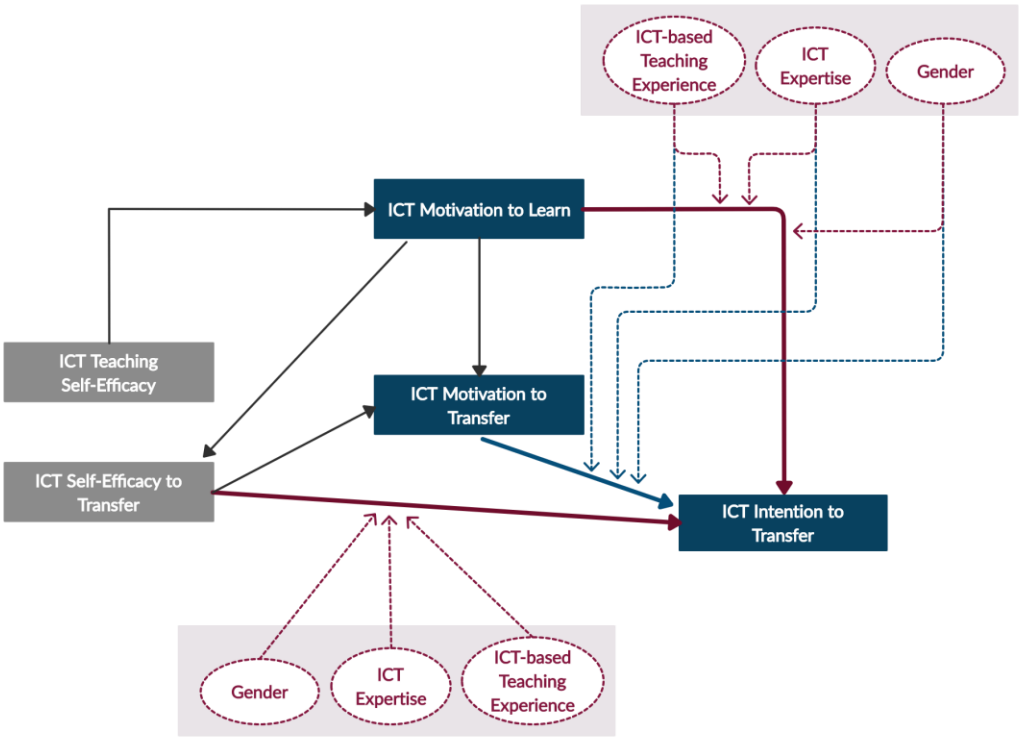

Figure 2 Conceptual model of moderating relationships

3. Methodology

3.1. Participants and procedure

Based on similar research methodologies that examined training transfer (Carlson et al., 2000; Lee et al., 2014; Facteau et al., 1995), we employed a set of questionnaire items to identify the participants' recent experience of their participation in the Teachers' Training Program on "Exploiting & Applying ICT in Education" conducted in Greece. Out of the 300 online questionnaires distributed to the participants, 117 (males = 50, females = 67) contained usable information (39% response rate). We were also careful to minimize biased questions or socially desirable responses; hence, certain techniques like reverse items and anonymity were used to eliminated these issues (Harrison et al., 1996; Podsakoff et al., 2003).

All participants were teachers of primary and secondary education participating as new ICT trainers of teachers in the national Teachers' Training Program on "Exploiting & Applying ICT in Education"[1]. After the successful completion of this training program, each one of these teachers will train other teachers on integrating ICT in education. The training program included two learning parts. The general part of the training aimed at developing knowledge and skills regarding recent trends and policies on ICT integration in education; epistemological, psychological, and pedagogical foundations for the use of ICT in education; adult education issues; ICT integration into the teaching practice using general-purpose software and educational software; selection and management of digital material and multimedia; management and support of the school computer laboratory. The

[1] See http://e-epimorfosi.cti.gr/en

specialized part of the training aimed at developing knowledge and skills regarding concepts of ICT-based teaching specific disciplines (subjects); design and implementation of training scenarios and activities for the specialty disciplines (subjects); design and implementation of educational environments; integrating ICT in teaching the specialty subjects.

As shown in Table 1 most of the teachers who participated in the survey teach Economics, Management, and Social Science, they are between 41 to 51 years old, and they are of high ICT expertise level.

Table 1 Demographical information of the sample group (N=117)

Age	n%	**Teaching courses**	n%	**ICT teaching experience**	n%	**ICT expertise level**	n%
<30	-	Economics, Management, and Social Science	22.2%	<5 years	-	Low (Windows, text editing-MS Word,email, search on web)	-
31-40	14.5%	Informatics	11.1%	5-10 years	32.5%	Average (Spreadsheets, e-banking)	44.4%
41-50	46.2%	Foreign Languages	16.2%	11-15 years	29.1%	High (programming/web development)	55.6%
51-60	39.3%	Natural Science	6%	15-20 years	20.5%		
>60	-	Primary Education	17.1%	>20 years	11.1%		
		Physical Education and Health	12.8%				

3.2. Instrument

The measurement instrument is based on previous training transfer related questionnaires (Chiaburu & Lindsay, 2008; Enos et al., 2003; Judge & Bono, 2001; Kim and Kim, 2003; Lee et al., 2014; Liebermann & Hoffmann, 2008; Ma et al., 2018) and has been adjusted to the ICT dimension of the training program.

The final questionnaire consists of 5 constructs making a total of 16 items. The questionnaire was developed and distributed in English. All items were measured on a 5-point Likert-type scale with 1 corresponding to “strongly disagree” and 5 to “strongly agree.” The questionnaire used is shown in Table A1 in Appendix A.

3.3. Data analysis and sample size adequacy

The data analysis methodology was chosen according to certain criteria. First, since the data are not normally distributed, non-parametric statistical approaches will be followed. As shown in Table 2, the measured variables are not normally distributed (Shapiro & Wilk, 1965) since their Sig. value for the test statistic (Statistic) is below 0.5 ($p<0.05$). The degree of freedom (df) which equals the sample size is shown as well.

Table 2 Shapiro-Wilk's normal distribution test

Variable	Statistic	df	Sig.
ICT Motivation to Learn (ICT-ML)	.698	117	.000
ICT Teaching Self-Efficacy (ICT-TSE)	.850	117	.000
ICT Self-Efficacy to Transfer (ICT-SET)	.808	117	.000
ICT Motivation to Transfer (ICT-MT)	.780	117	.000
ICT Intention to Transfer (ICT-IT)	.774	117	.000

Since the structural equation modeling approach (PLS-SEM) for multivariate analysis does not require normally distributed data (Hair et al., 2014), the PLS-SEM approach was adopted to analyze the structural relationships in the defined structural model. In addition, PLS is suitable for small sample sizes and complex models with numerous endogenous and exogenous constructs and indicator variables (Chin & Newsted, 1999; Hair et al., 2014; Ringle et al., 2014). According to researchers (e.g., Chin, 1998; Hair et al., 2011; Peng & Lai, 2012) the sample size for a PLS study should be at least ten times larger than the largest number of independent variables impacting a dependent latent variable. Our sample size exceeds the recommended lowest value of 60 since in our model, the largest number of independent variables impacting a dependent variable (ICT-IT) is six (ICT-SET, ICT-ML, ICT-MT, Gender, ICT expertise and ICT-based Teaching experience). Although there are some more suggestions, presented in Kock and Hadaya (2018) of how to estimate the minimum sample size that is adequate for PLS, it is the "10-times rule" that is mostly supported and adopted by the research community (e.g., in Hair et al., 2011; Peng & Lai, 2012; Terzis et al., 2013), mainly because of its simplicity of implementation and research validity (Kock & Hadaya, 2018).

To examine the moderating effect of the examined individual factors on the structural transfer training relationships, a categorical moderation and a plot slop analysis was conducted independently for every assumed moderator following the framework of Hair et al. (2014). The product indicator (Kenny & Judd, 1984) calculation method was deployed to analyze the PLS path modeling based on the approach of Chine et al. (1996; 2003).

To examine potential group differences in the mean scores of the latent variables, the non parametric methods of Mann Whitney and Kruskal-Wallis have been implemented. Moreover, descriptive statistics was used to demonstrate the mean scores and standard deviations of the measured variables.

The SmartPLS 3 (Ringle et al., 2015) software was applied to perform the PLS-SEM for the measurement, the structural and the conceptual model of moderators, while SPSS software was used to calculate descriptive statistics, conduct the 2-sample Mann-Whitney test, and the k-sample Kruskal-Wallis test.

4. Results

4.1. Descriptive statistics and group comparisons based on individual factors

Table 3 illustrates the descriptive statistics for all the measured items for the whole sample. As shown, the mean score (scaled from 1 to 5), the standard deviation, the minimum and maximum values are calculated for every defined construct. Overall, the participants reported relatively high levels of ICT-ML, ICT-SET, ICT-MT and ICT-IT. However, they reported lower mean scores in ICT-TSE, and the individual-level measures of ICT-Exp, and ICT-Teach.

Table 3 Descriptive statistics (N=117)

	Minimum	Maximum	Mean[1,5]	Std. Deviation
ICT Motivation to Learn (ICT-ML)	1,00	5,00	4,239	0,702
ICT Teaching Self-Efficacy (ICT-TSE)	1,00	4,00	2,623	1,127
ICT Self-Efficacy to Transfer (ICT-SET)	2,00	5,00	4,213	0,763
ICT Motivation to Transfer (ICT-MT)	1,00	5,00	4,162	0,819
ICT Intention to Transfer (ICT-IT)	1,00	5,00	4,205	,771
ICT Expertise (ICT-Exp)	2,00	3,00	2.658	0.658
ICT Teaching Experience (ICT-Teach)	2,00	4,00	2,560	0.499

Two groups were formed based on the participants' ICT expertise level: Average ICT expertise (e.g., using spreadsheets and e-banking applications) and High ICT expertise (e.g., knowledge of web programming/development). Four groups were formed based on ICT teaching experience, according to the participants' feedback on the corresponding questions.

Table 4 presents the Mann-Whitney results for comparing gender-based groups. As shown in the significance (Sig) value, significant gender differences have been detected in ICT

Intention to Transfer (IT) and ICT Self-efficacy to Transfer (SET), with female participants expressing higher levels of ICT-SET (females: mean=4.40, stdev=0.71; males: mean=3.96, stdev=0.75) and IT (females: mean=4.31, stdev=0.76; males: mean=4.06, stdev=0.76). ICT Motivation to Transfer (MT), Motivation to Learn (ML), and Self-Efficacy to Transfer (SET) do not seem to be affected by the factor of gender. The results also show the values of Mann-Whitney's U statistic, Wilcoxon's statistic (W), and the associated Z approximation; a detailed explanation of the statistical interpretation of these values can be found in Field (2000).

Table 4 Mann-Whitney Comparison for the latent variables
(Grouping Variable: Gender; N=117; males=50, females=67)

	ICT-ML	ICT-MT	ICT-IT	ICT-SET	ICT-TSE
Mann-Whitney U	1379.000	1486.500	1343.000	1120.500	1649.000
Wilcoxon W	2654.000	2761.500	2618.000	2395.500	2924.000
Z	-1.877	-1.140	-2.026	-3.307	-.148
Asymp. Sig. (2-tailed)	.061	.254	**.043**	**.001**	.882

As presented in Table 5, there is a strong correlation between levels of ICT expertise and levels of ICT teaching Self-Efficacy (TSE) for the studied sample. In particular, participants of average ICT expertise level expressed higher levels of ICT-TSE (Average ICT expertise level: mean=2.88, stdev=1.06; High ICT expertise level: mean=2.41, stdev=1.14).

Table 5 Mann-Whitney Comparison for the latent variables
(Grouping Variable: ICT Expertise; N=117)

	ICT-ML	ICT-MT	ICT-IT	ICT-SET	ICT-TSE
Mann-Whitney U	1514.500	1623.000	1600.500	1501.000	1301.000
Wilcoxon W	3659.500	3001.000	3745.500	2879.000	3446.000
Z	-1.108	-.403	-.544	-1.122	-2.207
Asymp. Sig. (2-tailed)	.268	.687	.587	.262	**.027**

As shown in the Kruskal-Wallis test in Table 6, ICT teaching self-efficacy is significantly correlated to participants' levels of post-training Self-Efficacy, since the significance value (Sig.) is below 0.5. In particular, the results in Table 6 reveal a significant difference in the ICT-SET levels among teachers' groups of different teaching experience levels. Interestingly, participants of a teaching experience from 15 to 20 years expressed the highest levels of ICT-SET (mean=4.50, stdev=0.78), while those with the lowest (<5years) and highest (>20 years) experience expressed the equally low levels of ICT-SET (mean=3.76). The results also show the values of the chi-square and the degrees of freedom (df). A large value of chi-square indicates large differences between the compared groups, confirming the significant difference found in ICT-SET (chi-square=8.12).

Table 6 Kruskal-Wallis test comparison for the latent variables
(Grouping Variable: ICT Teaching Experience; N=117)

	ICT-ML	ICT-MT	ICT-IT	ICT-SET	ICT-TSE
Chi-Square	2.656	3.055	7.488	8.125	.586
df	3	3	3	3	3
Asymp. Sig.	.448	.383	.058	**.043**	.900

4.2. Instrument validation

The survey model is assessed in terms of item loadings, reliability of measures, convergent validity, and discriminant validity. Cronbach's alpha is the common measure to test the items' internal consistency, which 'presents a reliability estimate based on the inter-correlations of observed variables' (Buhasho et al., 2021, p.342). Hair et al. (2017) recommended also the use of composite reliability because Cronbach's alpha can be sensitive to the number of the items in the scale and this can underestimate the consistency.
The average variance extracted (AVE) was employed to assess the convergent validity with its minimum value of 0.50. Convergent validity is the extent to which observed variables are highly correlated with a particular construct (Bagozzi & Yi, 1988).
The discriminant validity was assessed by the square root of AVE and latent variable correlations (Fornell & Larcker, 1981). Discriminant validity is the extent to which the construct is empirically distinct from other constructs (Hair et al., 2014). Although other approaches are also suggested to assess the discriminant validity (e.g., the Hetrotrait – Monotrait (HTMT) ratio of correlations method), in this study we used the common Fornell-Larcker criterion and the examination of cross-loadings to evaluate the discriminant validity of the constructs in the model.
As shown in Table 7 all criteria for composite reliability and convergent validity are satisfied. The values and the criteria are presented in footnotes below the Table 7.

Table 7 Reliability, Validity and Internal Consistency Results for the Measurement Model

Items	**Loadings[a]**	**Rho_a[b]**	**CR[c]**	**AVE[d]**
ICT Motivation to Learn		0.84	0.90	0.70
ICT-ML1	0.91			
ICT-ML2	0.91			
ICT-ML3	0.72			
ICT-ML4	0.78			
ICT Teaching Self-Efficacy		0.65	0.77	0.65
ICT-TSE1	0.82			
ICT-TSE2	0.90			
ICT Self-Efficacy to Transfer		0.89	0.91	0.71
ICT-SET1	0.90			
ICT-SET2	0.93			
ICT-SET3	0.85			
ICT Motivation to Transfer		0.92	0.95	0.87
ICT-MT1	0.92			

ICT-MT2	0.93			
ICT-MT3	0.93			
ICT Intention to Transfer		0.90	0.93	0.77
ICT-IT1	0.92			
ICT-IT2	0.89			
ICT-IT3	0.89			
ICT-IT4	0.80			

[a] All Items Loadings >0.5 indicates Indicator Reliability (Hulland, 1999, p.198)

[b] All Cronbach's Alpha (Rho_a) > 0.6 indicates Indicator Reliability (Hair et al., 2006)

[c] All Composite Reliability (CR) > 0.7 indicates Internal Consistency (Gefen et al., 2000)

[d] All Average Variance Extracted (AVE) > 0.5 indicates Convergent Reliability (Bagozzi & Yi, 1988; Chin, 2010; Forner & Larcker, 1981)

As shown in Table 8, we conducted a discriminant validity test based on the criteria of Fornell & Larcker (1981), since they are the most common and well-established criteria in the reviewed literature. As shown in Table 8, the Fornell & Larcker discriminant validity is supported since the square root of the AVE of a construct (presented in bold the column-cells in Table 8) is higher than any correlation with another construct (presented in the same line of the mentioned-bold value). Thus, both convergent and discriminant validity for the proposed research model are verified.

Table 8 The discriminant validity of the measurement model.

	ICT-IT	ICT -ML	ICT -MT	ICT -SET	ICT-TSE
Construct					
ICT-IT	**0.877**				
ICT-ML	0.628	**0.835**			
ICT-MT	0.910	0.574	**0.930**		
ICT-SET	0.768	0.559	0.744	**0.844**	
ICT-TSE	-0.160	-0.180	-0.144	-0.217	**0.860**

4.3. Testing the structural model

The structural model was employed to test the defined research hypotheses. The test was based on the path coefficients and the R^2 values (Chin & Newsted, 1999). Usually, path coefficients greater than 0.1 with t-values greater than 1.96 are significant at 0.05 levels. Both the path coefficients and the variance R^2 values were evaluated via a PLS algorithm and a bootstrapping procedure (Chin & Newsted, 1999).

As shown in Table 9, the results of the structural model highlight the confirmation of nine out of twelve hypotheses and rejection of three hypotheses (H4, H10, and H12). Results in variance (R^2) also illustrate that this model explained 86.6% of the variation in intention to transfer, 32% in motivation to learn, 35.6% in self-efficacy to transfer and 58.9% in

motivation to transfer. In particular, Table 9 presents (apart from variance R^2) the examined relational paths according to the defined hypotheses, their extracted by the bootstrapping procedure path coefficients, as well as the means and standard deviation values and the t-statistic. The examined hypotheses are supported if the value of t-statistic is above 1.96 for $p<0.05$.

Moreover, the structured model showed acceptable goodness of fit (Standardised Root Mean Residual [SRMR] = 0.064 and chi-square = 369.315) according to the model fit acceptance criteria in Hair et al. (2014).

Table 9 PLS results in relationships

	Construct	R^2				
	ICT-SET ICT-ML ICT-MT ICT-IT	0.356 0.032 0.589 0.866				
Label	Path	Path Coefficient	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	Results
H8	Gender→ ICT-IT	0.069**	0.062	0.039	1.773	**support**
H9	Gender → ICT-SET	0.142**	0.170	0.084	2.098	**support**
H10	ICT-Exp → ICT- IT	-0.056**	-0.060	0.034	1.672	not support
H11	ICT-Exp → ICT-SET	0.155**	0.150	0.079	1.970	**support**
H1	ICT-ML → ICT-IT	0.119**	0.121	0.042	2.853	**support**
H2	ICT-ML → ICT-MT	0.229**	0.234	0.090	2.562	**support**
H5	ICT-ML → ICT-SET	0.552***	0.549	0.107	5.204	**support**
H3	ICT-MT → ICT-IT	0.731***	0.723	0.048	15.071	**support**
H7	ICT-SET → ICT-IT	0.148***	0.155	0.056	2.667	**support**
H6	ICT-SET → ICT-MT	0.615***	0.612	0.085	7.205	**support**
H12	ICT-Teach → ICT-IT	-0.025	-0.027	0.036	0.691	not support
H4	ICT-TSE → ICT-ML	-0.18**	-0.186	0.080	2.246	not support

$^{**}p < .05$, $^{***}p < .01$.

4.4. Indirect effects of pre- and post-training self-efficacy on intention to transfer

The results in Table 10 demonstrate the existence of several indirect effects on the ICT intention to transfer. In particular, both post- and pre-training self-efficacy measures bring

statistically significant indirect effect on intention to transfer ICT skills and knowledge. Some other direct effects occur in the structured model since both Gender and ICT-ML seem to indirectly affect ICT-IT, ICT-MT, ICT-ML. ICT-SET and ICT-MT are the mediating variables correspondingly in every above-mentioned case. Table 10 shows the path coefficient score for every examined path of relationship between the constructs, the mean, the standard deviation and the t-statistics. Overall, it is proved that gender and self-efficacy related constructs also bring indirect effects on ICT-IT.

Table 10 Significant indirect effects

Path	Path Coefficient	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics
ICT-SET → ICT-IT	0.450***	0.442	0.061	7.363
ICT-TSE → ICT-IT	-0.112***	-0.117	0.050	2.211
ICT-ML → ICT- IT	0.530***	0.495	0.091	5.492
Gender → ICT-IT	0.084**	0.105	0.054	1.936

$^{**}p < .05$, $^{***}p < .01$.

4.5. Moderating effects of individual factors (gender)on the relationships towards intention to transfer

Since the variables of ICT Expertise and ICT-based Teaching Experience did not reveal any significant path coefficient towards ICT Intention to Transfer ICT knowledge and skills (although it revealed significant effects on Motivation to Transfer), the analysis of moderating effects towards ICT Intention to Transfer only includes the individual factor of gender.

The results in Table 11 reveal that gender plays a significant moderating role in the relationship between Motivation to Learn and Intention to Transfer ICT knowledge and skills, while it does not seem to cause any moderating effects on the relationships between ICT Motivation to Learn / Motivation To transfer and Self-Efficacy to Transfer / Intention to Transfer. The findings empirically show that at the significance level of $p < 0.05$ and $t > 1.96$, the moderating impact of gender to the relationship between ML and IT is positive and statistically significant. However, despite the statistically significant moderating effect, the low effect size ($f=0.040$) does not explain the variance in the examined moderating relationship. Also, Figures A1-A3 in Appendix A show the visual plot slopes for interaction of the examined moderating relationships. The three lines shown in A1-A3 reflect the one relational construct e.g. ML (x-axis) to the other construct e.g. IT (y-axis). The middle line reflects the relationship for a mean level effect of the moderating variable gender.

Table 11 Moderating effects of gender

Moderator	Moderating Effect on Relationship	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values
Gender	ML → IT	-0.252	0.133	**2.016**	**0.044**

Gender	MT → IT	-0.113	0.126	0.970	0.333
Gender	SET →IT	-0.101	0.127	0.879	0.380

5. Conclusions and discussion

The main objective of this study was to propose and preliminarily test a model including cognitive (ICT self-efficacy) and personal (gender, ICT expertise, ICT teaching experience) antecedents of ICT transfer training constructs, namely motivation to learn, motivation to transfer, and intention to transfer ICT knowledge and skills. Overall, our findings provide support for our propositions.

Based on the non-normality observed in the data, this study conducted a set of non-parametric statistical measures to examine a set of differences in the examined constructs across different groups of participants. Overall, gender, ICT-teaching experience and ICT expertise revealed a few significant differences in the constructs (ICT-IT, ICT-SET and ICT-TSE) that are later discussed. The results of descriptive statistics revealed that the participants perceive on average high values of transfer training related variables (ICT-ML, ICT-MT, ICT-IT and ICT-SET) but lower values of individual variables like ICT expertise and ICT-related teaching experience.

The instrument evaluation tests and the discriminant validity results validated the consistency and reliability of the structural composition of the proposed model; the model fit criteria reinforced the validity of the model.

The hypothesized direct and indirect relationships in the model were examined through a PLS-SEM approach. Figure 3 summarizes the main outcomes of the PLS-SEM study illustrating the significant relationships along with path coefficients. As shown, the research model confirms the direct relationships between the transfer training variables of ML, MT and IT. Red lines illustrate the confirmed indirect relationships in the links ICT-TSE → ICT-IT, ICT-SET → ICT-IT and Gender → ICT-IT. In particular, Gender brings indirect effects on IT through SET, SET brings indirect effects on ICT-IT through ICT-MT, and ICT-TSE brings indirect effects on ICT-IT through ICT-ML. Furthermore, Gender causes a mild moderation effect on the relationship path between ICT-ML and ICT-IT.

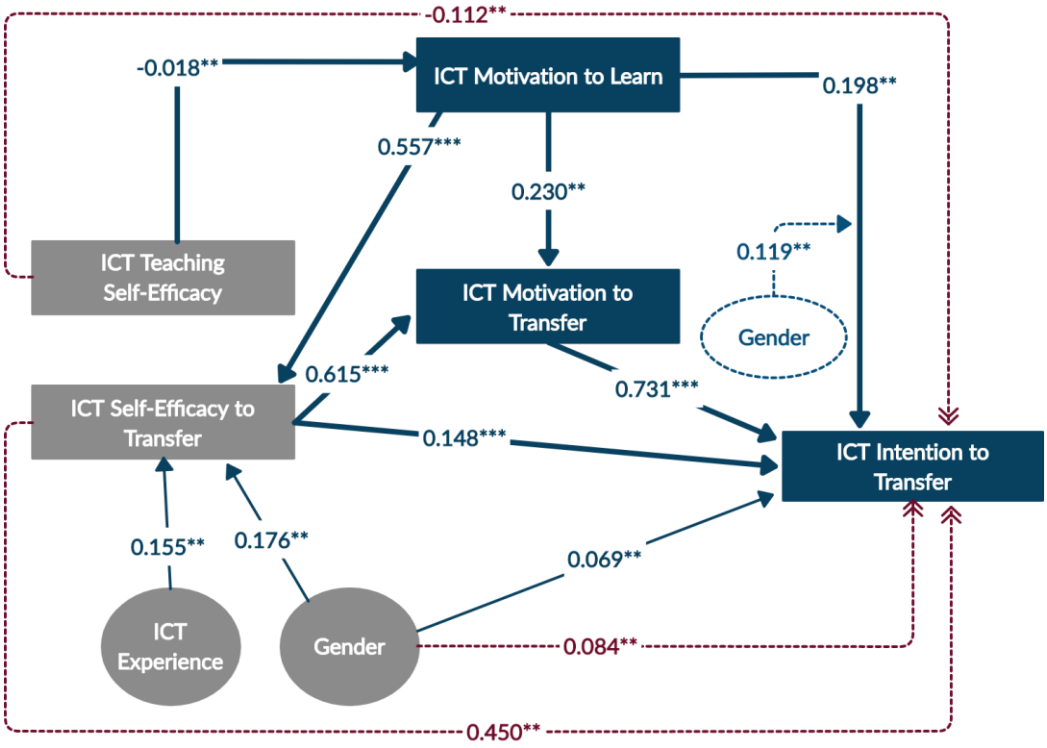

Figure 3 Overall relationship results of direct, indirect and moderating effects (**p < .05, ***p < .01)

Most of the research hypotheses were confirmed and only two hypotheses failed in their direction or strengthen statements. Interestingly, ICT-TSE shows a negative correlation to ML and a negative indirect effect on IT. On the contrary, SET is positively associated with MT and IT. This outcome might reveal that pre-training low levels of ICT-related teaching self-efficacy reinforces individuals' motivation to learn and participate in an ICT transfer training program. Then in the post-training phase, higher levels of ICT self-efficacy to transfer leverage teachers' trainers' motivation and hence intention to transfer ICT knowledge and skills by both training their colleagues and integrating digital technologies in their teaching practice. This comes in accordance with research indicating that individuals higher in self-efficacy set more challenging goals for themselves than do individuals with lower self-efficacy (Bandura, 1986). Practical implications consider the enhancement of digital teaching self-efficacy during the training process, for example through observation of a mentor or another teacher successfully using ICT in their classrooms (Instefjord & Munthe, 2017).

Contrary to previous statements that no significant gender differences are found in post training variables (Kay, 2006; Norris et al., 2003), this study findings shed light to gender differences in teachers' trainers' post-training self-efficacy and intention to transfer ICT knowledge and skills .

The proposed model also reveals the direct links between teachers' trainers' ICT teaching experience and ICT expertise both to transfer training and ICT self-efficacy variables.

These findings come in accordance with previous ICT research stating that individual factors might significantly affect transfer training variables (van Braak et al., 2004).

Among the examined individual factors, this study showed that gender exhibited the strongest effects on the transfer training model variables and determined its mediating role in the model's basic relationship between ML and IT. However, the low value of the effect size implies a potentially non meaningful moderating effect and gender can be considered for now a mild moderator that needs to be further analyzed in future studies. In any case, the current findings highlight the importance of considering gender in ICT-related educational studies when tracing theoretical models to study individuals' perceptions and/or behaviors. Gender seems to bring significant individual differences as well; findings in Table 4 reveal the gender-based differences in teachers' trainers' ICT-IT and ICT-SET. This might shed light on a different side of ICT transfer training models since in previous studies (focused on non-ICT-related transfer training) gender showed no significant effects on post-training measures (e.g., Kay, 2006; Norris et al., 2003). This observation is crucial in the field of acceptance and integration of ICT and digital technologies confirming the continuation of the "gender gap" in computing and technologies (EC, 2019).

Our findings contribute in the research field and expand previous studies in several ways. First, we demonstrated that ICT-related pre- and post-training self-efficacy measures play a significant role in ICT transfer training models, bringing both direct and indirect effects on the ICT transfer training variables. Second, individual factors like gender and ICT expertise should be included or considered as moderators (or mediators) in the future ICT transfer training models. Especially gender shall be further analyzed in different populations since it revealed significant differences in the mean scores in two out of three transfer training variables.

Implications to Education

The findings of this research imply that teacher training institutions and ICT transfer training program designers should consider the participants' gender and ICT-related individual factors to achieve efficient transfer training outcomes.

Also, practices to increase the participants' motivation to learn (Appova & Arbaugh, 2018) and ICT self-efficacy levels should be adopted in the design of ICT transfer training programmes. In case of female participants, research shows that the inclusion of role models (e.g., use cases or video-based examples presenting women achieving similar tasks), and collaborative learning activities tend to positively affect women's motivation and ICT self-efficacy levels (Burnett et al., 2016). The gender factor could be taken into consideration in the design of the learning platform as well, e.g. by integrating gender neutral or gender inclusive design principles (Burnett et al., 2016; Grigoreanu et al., 2008; Metaxa-Kakavouli et al., 2018). There are several approaches that are effective both for men and women; features designed explicitly for diverse self-efficacy levels have been shown to be preferred by everyone (e.g., Grigoreanu et al., 2008).

Another approach that teachers' transfer training program designers could apply is the provision of personalized learning activities according to the participants' ICT expertise level. In this way, transfer training programmes' participants with lower ICT expertise or experience should be encouraged to participate in further ICT-based activities to further

develop their ICT skills, and hence leveraging the levels of their post-training ICT self-efficacy to transfer.

Possible limitations and future research

The results of this study should be interpreted considering possible limitations.

First, data was collected via self-reported measures and hence results might be prone to bias. Future research could eliminate this issue by implementing for instance mixed methodologies or classroom observations.

Second, the generalizability might be limited since the population participating in the study is specific to one country (Greece). Since there are cultural differences among European countries, these should be reflected in future studies (Nistor et al., 2013).

Third, future research should be conducted on larger samples to further validate our research results. Although the sample size of this study is in accordance with common PLS-SEM study criteria (Chin, 1998; Hair et al., 2011; Peng & Lai, 2012), other researchers suggest conducting additional power analysis to estimate the minimum sample size (Hair et al., 2014). Yet, the calculated number is suggested to be doubled or tripled to obtain more consistent results (Ringle et al., 2014).

Moreover, although the model's construct validity and the model fit criteria are efficient according to the discussed methodologies, recently researchers (Henseler et al., 2015) suggest that Fornell & Larcker (1981) method does not reliably detect the lack of discriminant validity in common research situations. An alternative, the Hetrotrait – Monotrait (HTMT) ratio of correlations is suggested (Henseler et al., 2015). If the HTMT value is below 0.90 (Gold et al., 2001; Teo et al., 2008), discriminant validity has been established between two reflective constructs. However, the threshold of 0.90 (or 0.85 according to other researchers (Clark & Watson, 1995; Kline, 2011) is debatable. What is agreed is that the values should not be close to one. In this study, after analysing the HTMT ratio of the correlations in the model, one slightly inefficient value (=0.90) of discriminant validity was observed between the constructs of ICT motivation to transfer and ICT intention to transfer. This issue was resolved and the HTMT value was established at 0.68 when we aggregated the two constructs in a single latent variable, combining their items following the suggestions in Farrell (2010). Based on this observation and on the fact that most previous literature studies base their findings on the Fornell & Larcker criteria of discriminate validity, we suggest that further research is needed and we encourage research on future ICT transfer training models where the combination of intention and motivation to transfer variables is considered.

Finally, other individual factors shall be examined in the future, focusing on factors affecting teachers' motivation to learn and engagement in transfer training programs (McMillan et al., 2016).

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Appendix A

Table A1 Questionnaire items used

Construct	Item	
ICT Motivation to Learn		*I have participated in this Teachers' Training Program on "exploiting and applying ICT in Education" because:*
	ICT-ML1	I am interested in learning new knowledge and ICT skills on using ICT in Education.
	ICT-ML2	I want to improve my Teaching using ICT.
	ICT-ML3	My colleagues have attended a similar Training and believe it is worthy.
	ICT-ML4	I feel responsible to help my colleagues and students on using ICT in Education.
ICT Teaching Self-Efficacy		*Before attending this Teachers' Training Program on "exploiting and applying ICT in Education", I was feeling:*
	ICT-TSE1	Confident to teach my students using ICT.
	ICT-TSE2	Confident to train my colleagues on how to use ICT in Education.
ICT Self-Efficacy to Transfer		*After participating in this Teachers' Training Program, I feel:*
	ICT-SET1	Capable of training my colleagues what I have learned in this Training.
	ICT-SET2	Capable of teaching my students what I have learned in this Training.
	ICT-SET3	Confident that I will successfully transfer to my students what I have learned in this Training.
ICT Motivation to Transfer		*After participating in this Teachers' Training Program,*
	ICT-MT1	I want to transfer my new knowledge & ICT skills to Train my colleagues on Teaching using ICT.
	ICT-MT2	I feel responsible to share with my colleagues what I have learned in this Training.
	ICT-MT3	I feel responsible to teach my students what I have learned in this Training.
ICT Intention to Transfer		*After participating in this Teachers' Training Program,*
	ICT-IT1	I will apply what I have learned in this Training to train my colleagues.
	ICT-IT2	I will apply what I have learned in this Training to teach my students.
	ICT-IT3	I prefer not to use the educational resources of this

ICT-IT4	Training to train my colleagues. I will use the educational resources of this Training to teach my students.

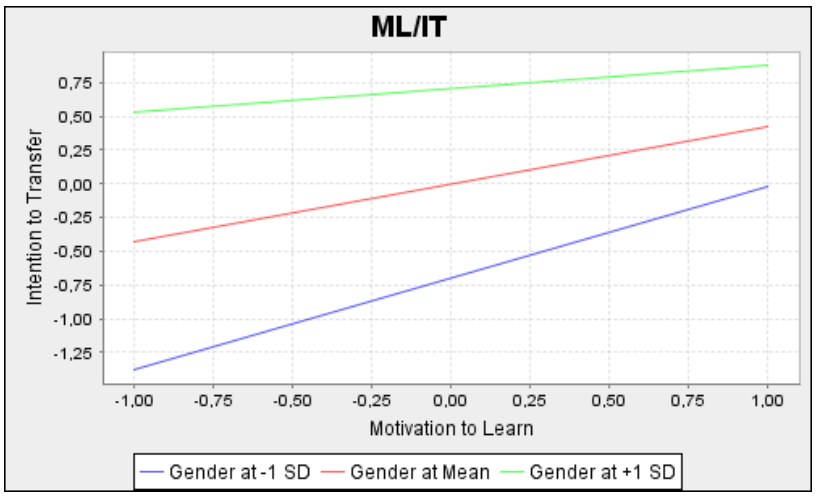

Figure A1 Plot slop of the moderating effect of gender in the relationship ICT-ML → ICT-IT

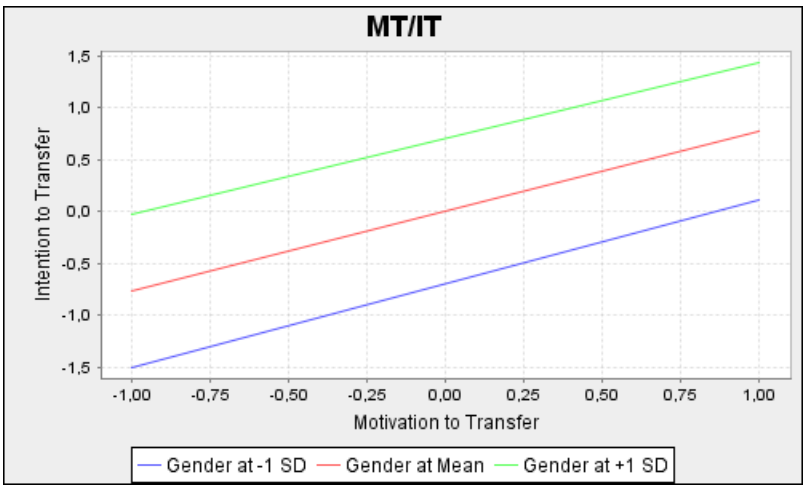

Figure A2 Plot slop of the moderating effect of gender in the relationship ICT-MT → ICT-IT

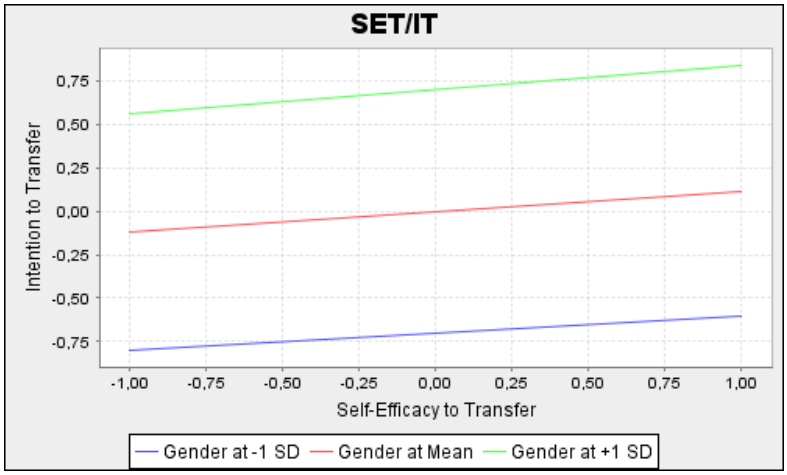

Figure A3 Plot slop of the moderating effect of gender in the relationship ICT-SET → ICT-IT