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## **ICT Interventions for Schoolgirls Do Matter! Understanding the Factors Influencing ICT Career Intentions through Partial Least Squares Analysis.**

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# ICT Interventions for Schoolgirls Do Matter!

## Understanding the Factors Influencing ICT Career Intentions through Partial Least Squares Analysis.

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### Abstract

*Intervention programs aimed at promoting study and work opportunities in the Information and Communications Technology (ICT) field to schoolgirls (Interventions) have been encouraged to combat a decline in the interest among girls to study ICT at school. The goal of our study is to investigate the influence of Interventions on schoolgirls' intentions to choose a career in the ICT field by analysing the comprehensive survey data (n = 3577), collected during four interventions in Australia, using the Partial Least Squares method. Our study is also aimed at identifying other factors influencing ICT career intentions. We found that the attitude towards interventions has an indirect influence on ICT career intentions by affecting interest in ICT. Our results also challenge several existing theoretical studies by showing that factors that had previously been suggested as influencers were found to have little or no impact in this study, these being same-sex education and computer usage.*

### Keywords

Intervention, Girls and ICT, Gender diversity.

### INTRODUCTION

Information and Communication Technology (ICT) is an umbrella term encompassing computing technology in a wide ranging continuum from engineering to business. ICT incorporates the disciplines of Computer Science (CS) and Information Systems (IS). According to the United Nations Commission on the Status of Women, mainstreaming a gender perspective in technology and innovation enhances social and economic equity (United Nations 2011). They argue while efforts are being made to expand access to ICT “far less attention is being paid to the extent to which women and gender concerns are shaping the regulatory and policy environments that will ultimately determine the utility and relevance of these technologies. The strategic challenge today is to ensure not only that both women and men benefit from the opportunities presented by new ICT, but also that new ICT are used to support greater socioeconomic, scientific and political equality” (UNESCO 2007, p31).

Practically, fewer than one-third of the vacant computing jobs expected by 2018 in the United States (U.S.) will be filled by U.S. graduates with computing degrees, which is partly due to the decreasing number of girls studying an ICT-related subject at school (Ashcraft and Blithe 2010). Even with unprecedented demand for qualified computing workers, there has not been a significant uptake of females to fill this need. From an academic perspective, it is also argued that recruitment and retention of women in the ICT industry is particularly challenging (Trauth et al. 2009).

The call from the United Nations related to the lack of female participation in ICT in most developed countries is difficult to ignore by educators and researchers. To combat the decline in interest among girls in studying ICT at school, and ultimately at university, intervention programs for girls in ICT (Interventions) have been encouraged on a number of levels. The goal of our study is to investigate the influence of Interventions on schoolgirls' intentions to choose a career in the ICT field and to understand other motivating factors. This leads to the following research questions (RQs):

RQ1: What factors influence schoolgirls' ICT career intentions?

RQ2: Do Interventions have an influence on ICT career intentions?

In order to answer these questions a quantitative research study was carried out using comprehensive survey data ( $n = 3577$ ). We could not find a well-established theoretical framework on the factors influencing girls' ICT career intentions, but there are several conceptual studies assuming a strong influence of career intentions on the actual career choice (e.g. Johnson et al. 2008). As a starting point the model on the factors influencing girls' career choices by Adya and Kaiser (2005) was used. The data was collected during four "Go Girl, Go for IT" Interventions in Australia in 2006, 2008, 2010 and 2012 (the Events). A model showing the influence of Interventions on ICT career intentions was developed and tested using Partial Least Squares (PLS) regression (Marcoulides et al. 2009).

This paper begins with a synthesis of previous research on successful Interventions and an overview of studies on ICT career intentions and career choice. Introduction of the developed model showing the role of Interventions in ICT career intentions is followed by the description of the applied research methodology and presentation of the results. In the concluding sections the study contribution, limitations and propositions for future research are discussed.

## BACKGROUND

Although the trend across tertiary education level shows a general increase in the number of highly educated females, in specific sectors such as CS and IS, female graduates are significantly outnumbered by male graduates (European Commission 2008, p28). The average percentage of female graduates in the science and technology field in Europe is 33% (European Commission 2012). Similar trends are evident in Australia. Not only is female participation in computing education dropping, participation generally is also reducing. The Australian Computer Society indicates that the number of students completing ICT post-secondary qualifications has dropped by almost 30% from approximately 19000 completions in 2003 to just under 13500 in 2010 (Australian Computer Society 2012). Adding to the concern are the number of females graduating without computing skills from secondary education; the number in Victoria was down dramatically from 7315 in 2001 to 790 in 2011 (VCAA Statistics 2013). Only 96 female students (and 1208 male students) successfully completed software development at senior secondary level (VCAA Statistics 2013).

As mentioned in the previous section, interventions are one possible means to tackle this challenge. While there are intervention programs aimed at women (Panteli 2012), this paper focuses on intervention programs aimed at secondary school girls (Interventions). There are strong claims that middle school is a critical period for getting girls interested in computing. According to Quesenberry and Trauth (2012), "in creating interventions to increase the representation of women in the ICT profession, it is crucial to develop those that influence young girls' perceptions of careers in the ICT workforce." However, Denner (2011) argues that there is little research to guide the development of interventions. Craig (2010) suggests that there is little evidence in the literature of 'which interventions work best for whom' as many interventions are implemented by volunteers who are more concerned with conducting the actual intervention than with formally evaluating the program or disseminating findings.

Bravo and colleagues (2003) provide some relevant insight into successful interventions, identifying a number of essential requirements based on their aim to change computing classroom behaviour to be a more welcoming environment for girls. To complement this list, Allison and Cossette (2007) present a summary of STEM (Science, Technology, Engineering, and Mathematics) recruitment strategies discussed in the literature and there are many similarities with the conceptualisation by Bravo and colleagues (2003). In doing a comparison of what makes a successful intervention there are important differences to highlight. Allison and Cossette (2007) argue that there is a need to create a positive and non-aggressive environment, to emphasize family and parental roles in building confidence, and encouraging mentoring relationships; these elements are not in the conceptualization by Bravo et al. (2003) who, however, identify one additional element which relates to deconstructing the essentialist view of a "natural" attraction to computers. This paper proposes that all of these elements can help to create a successful intervention and they are purposefully planned into the design of the Interventions discussed in this study (the Events) in a variety of ways. Thus, the ongoing design of the Events is continually guided by theory and practice relevant to gender and technology.

A number of successful Interventions have been reported in the academic literature. In the U.S. the interventions based at Harvey Mudd College and Georgia Tech University are well-known among gender and computing researchers. A small liberal-arts college focusing on science and engineering, Harvey Mudd College has increased the percentage of women students in the CS major from an average near 12% to around 40% through a variety of interventions. Part of their strategy was to encourage students to attend summer research experiences (Alvarado et al. 2012). The "Georgia Computes!" intervention program targets females at different stages of the

“pipeline”; they also invite secondary school students to attend summer computing camps. They report that these activities have been “overwhelmingly positive” (Bruckman et al. 2009). On evaluating the program, they found statistically significant improvements in students’ attitudes about computing in response to survey questions like “Computer jobs are boring”, “Girls can do computing,” and “Programming is hard.” Their intervention consisted of 13 events with both pre-surveys and post-surveys, and 7 of the workshops had a statistically significant improvement in participants’ attitudes about computing.

Intervention strategies to increase the participation of girls in computing in Australia have also been documented in the academic literature. One example is the *Digital Divas* program which “aims to scaffold positive perceptions around computing in the early years of secondary school by involving female students in upbeat computing experiences over a semester” (Fisher et al. 2009; Lang et al. 2010). The curriculum for the intervention was designed to promote positive experiences in regard to self-efficacy and persistence with computing courses and career decisions. Positive outcomes were reported related to the female-only environment, the presence of role models and the encouragement of creativity in using technology.

Reports of successful interventions however may not necessarily be published in the academic literature even though a thorough evaluation may have been completed. One example of this is the intervention conducted by the National Center for Women & Information Technology (NCWIT) in the U.S. which reported that their “*Computer Mania Day*” positively influenced students’ general feelings toward technology, their feelings regarding the usefulness and utility of computers and technology, and their feelings regarding women’s involvement in technology. The study also found that students were more likely to take a computer course and consider a career in ICT after participating in “*Computer Mania Day*” (Morrell et al. 2004).

As our study concentrates on schoolgirls who haven’t made their career choice yet, we can investigate only their intentions towards a future career in the ICT field. Several studies having a similar focus and also discussing the relation between intentions and actual career choice were found in the literature.

In the Australian context one study identified the factors influencing girls in their decisions regarding computing and future careers. It was reported that Interventions have a positive effect in a way that participating girls were more positive about careers in computing and were more likely to consider enrolling in university CS courses (Anderson et al. 2008). Outside of Australia, a comparison study of African Americans and Anglo Americans examining ICT career intentions revealed that ICT self-efficacy and occupational stereotypes were related to attitudes toward ICT jobs, and that these attitudes were positively related to career intentions (Johnson et al. 2008). From a psychological perspective, BarNir et al. (2011) found that role models have a significant and positive impact on career intentions, and that gender moderated the effects and self-efficacy mediated them. Another study of Greek high school students’ intentions and motivation towards and against pursuing academic studies in CS found that girls are less likely than boys to pursue a CS degree, and when they do so, it is mainly because of extrinsic reasons rather than personal interest in CS. Computer self-efficacy was found to be related to intention to study CS. The study found that a considerable proportion of Greek students opt for studying CS, however girls constitute a minority giving credence to the phenomenon of the “shrinking pipeline” (Camp 1997) according to the authors (Papastergiou 2008).

This study uses as a starting point the Adya and Kaiser’s (2005) well cited model for girls’ career choices in technology fields in order to better understand girls’ intentions to undertake a career in ICT. The model is based on literature to hypothesise about the future of the ICT workforce. The literature stems from a variety of disciplines, including education, psychology, sociology, CS, IS and business. The model identifies relevant factors influencing girls’ career choices, which include:

- *Social factors: Role Models and Gender Stereotypes.*
- *Structural factors: Technology Resources and Same-sex Education.*
- *Individual differences* (based on the Trauth’s (2002) Individual Differences Theory of Gender and IS).

An early version of the “*Go Girl, Go for IT*” Intervention discussed in this study was conducted in Queensland, Australia in 2000 (Craig et al. 2008) with many such events conducted in various states since then. The Event fits Courtney et al.’s (2005) classification of interventions, but not neatly. The Event lasts two days and is historically organised by an ICT industry group, which is driven by government policy. The Event is hosted and partially funded (mostly in-kind) by a local university, and volunteers participate as part of the organizing committee and as presenters on the day. The Event is aimed at building awareness about ICT career requirements and expectations, and the types of education, knowledge and skills required to work in the industry. The overall goal is to encourage participation of females in ICT studies and careers. Most of the sessions are presentations by industry professionals with PowerPoint slides and video content. The Event is attended by secondary schoolgirls between the ages of 13 and 17. Girls attend the Event either as a group from a computing

class invited by their ICT teacher (usually female), or they volunteered to attend as individuals with interest in the Event. Therefore, if less computing classes are being offered at secondary school, the pool of possible participants to attend the Events becomes smaller, which, unfortunately, is the case and can be seen in the statistics of Events' participants (please see the Method and Discussion sections for more details).

## RESEARCH MODEL

The data used in this study originates from a two-page questionnaire handed out to the girls attending the Event<sup>1</sup>. It has to be mentioned that the main aim of the questionnaire was to collect feedback and evaluate the Event. Therefore, the questionnaire was not intended to test a certain model or build a theory. Nevertheless, besides the attitude towards the Event, the participants were asked several additional questions, e.g. on their intentions to learn more about ICT and to work in the ICT field in the future, on the frequency and purposes of computer usage, some background information including age and type of school attended etc.

After having a closer look at the data available, we found enough questions to analyse *ICT Career Intention* (e.g. whether ICT was considered as a career option before the Event and how the Event affected it). As it was mentioned in the previous section, career intention has a strong relationship to career choice. Therefore, we decided to use the Adya and Kaiser (2005) model on the factors influencing girls' career choices as a starting point to map the information available to the model's factors:

Attitude towards the Event (*Event Attitude*) can be related to the model's *Social Factors*:

- One of the Interventions' main goals is to tackle *Gender Stereotypes*.
- People (women or men) who give presentations at such Interventions can act as *Role Models* for participating girls.

Information from responses to other questions can be mapped to *Structural Factors*:

- The *Technology Resources* factor can be partially tested using the questions on frequency (amount of hours per week) and purposes of computer usage (*Computer Usage*).
- The *Same-sex Education* factor can be tested using the information about the schools attended by the respondents.

Based on the propositions made in the Adya and Kaiser (2005) model and the information available in the questionnaire, some initial hypotheses were built on possible factors influencing *ICT Career Intention*:

*H1: Favourable Event Attitude has a positive influence on ICT Career Intention*

*H2: Frequency of computer usage (Computer Usage) has a positive influence on ICT Career Intention*

*H3: Usage of computers for building web sites or programming (Computer Usage) has a positive influence on ICT Career Intention*

*H4: Sex-segregation of school environment (Same-sex Education) has a positive influence on ICT Career Intention*

*H5: Interest in ICT (ICT Interest) has a positive influence on ICT Career Intention*

*H6: Intention to find out more about ICT after the Event (ICT Intention to Learn) has a positive influence on ICT Career Intention*

In order to test whether any dependencies between these constructs exist at all, Pearson correlation coefficients between all the variables were calculated (Rodgers and Nicewander 1988). We found that *ICT Career Intention* has strong positive correlations with *ICT Interest* and *ICT Intention to Learn* and moderate positive correlation with *Event Attitude*. Moreover, we found that *ICT Interest* has strong significant correlations with both *Event Attitude* and *ICT Intention to Learn* (please see the Results section for more details). No significant correlations were found between *ICT Career Intention* and *Computer Usage* or *Same-sex Education*, which contradicts the propositions made in the Adya and Kaiser (2005) model. Thus, hypotheses *H2*, *H3*, and *H4* had to be rejected and not taken into consideration for building a research model.

Based on the results, we suggest that both *ICT Interest* and *ICT Intention to Learn* influence *ICT Career Intention*. We also assume that *Event Attitude* has an influence on *ICT Interest*, which, in turn affects *ICT Intention to Learn*. Our Research Model for further testing is presented in Figure 1.

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<sup>1</sup> Please contact the authors for more information on the questionnaire used in the study.

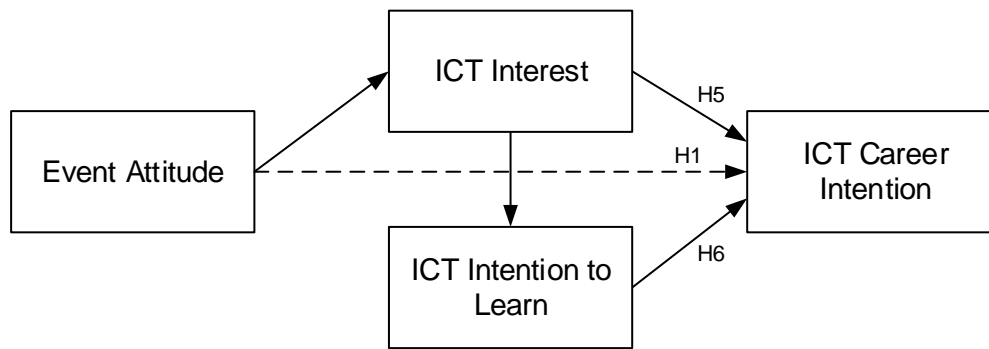


Figure 1: Research Model

## METHOD

The questionnaire was adapted from a similar one used at another Intervention and pre-tested by three people. In order to motivate girls to fill in a questionnaire, a show bag full of gifts provided by participating organizations was given in return for a completed questionnaire. This was a highly successful strategy and the absolute majority of the Event participants took part in the survey. As a result, in total 4168 responses were received: 1668 in 2006, 1070 in 2008, 792 in 2010, and 638 in 2012. Such a decrease in the amount of responses after 2006 happened because fewer girls had a chance to participate in the Events. The two main reasons here are administrative issues (there was little chance to schedule the Events in 2008-2012 to fit the schools calendar) and a decrease in the number of ICT teachers who usually organised the trips (please see the Discussion section for more details). In the questionnaire we asked both open-ended and closed-ended questions, but for this study we concentrated on the closed-ended questions in order to test the proposed hypotheses.

Once initial responses were coded using MS Excel, we first introduced a construct categorizing girls according to their *ICT Career Intention* using SPSS 21 software. Anderson et al. (2008) differentiated between those girls who take ICT subjects at school and those who do not and called them “*Takers*” and “*Non Takers*” respectively. We applied this classification to the girls’ attitude towards career in ICT and extended it by introducing a new category of “*Newcomers*”:

1. *ICT Career Current Non Takers (Non Takers)*: girls who did not consider ICT as a career option neither before nor after the Event.
2. *ICT Career Newcomers (Newcomers)*: girls who did not consider ICT as a career option before the event, but changed their mind during the event.
3. *ICT Career Potential Takers (Takers)*: girls who considered ICT as a career option both before and after the event. We consider this group to be more robust in their *ICT Career Intention* than *Newcomers*.

We then cleansed the data: The 320 cases containing missing data to any of the questions related to our target variable *ICT Career Intention* were removed. A category of cases with positive responses on ICT as a career option before the Event, but negative – after the Event (meaning that the Event had a negative influence on *ICT Career Intention*) was very low in comparison to the other three above-mentioned categories ( $n = 136$ ) and, therefore, was not taken into consideration in the current study. Moreover, the questionnaire has several control questions with mutually exclusive responses. The 135 cases with inconsistent responses to control questions were also deleted. The resulting study sample containing 3577 cases is examined in Table 1.

As mentioned in the previous section, the initial hypotheses were analysed employing Pearson correlation coefficients and SPSS 21 software. The developed model was further tested using the Partial Least Squares (PLS) method and SmartPLS 2.0 (Ringle et al. 2005). The PLS algorithm was chosen because it has no distribution assumptions for the measured variables and is a relatively flexible forecasting method. All constructs were modelled using reflective indicators. The analysed data (involved in the developed model) contains 14.8% missing values, which were treated using the Case Wise Replacement algorithm.

## RESULTS

*Newcomers* is the largest category in the sub-samples for each Event and in the resulting sample; *Non Takers* is constantly the smallest category (see Table 1). Two conclusions arise from this statistics: first, among secondary

schoolgirls (at least those participating in Interventions) there are very few who neglect ICT, the absolute majority consider this field as favourable for future studies and career. Second, the Event on average motivated more than 40% of girls to start considering ICT as a career option, which was not the case before the Event.

Table 1. Study Sample and Distribution of ICT Career Intention Categories

Year	<i>Non Takers</i>		<i>Newcomers</i>		<i>Takers</i>		Total (Year)	
	n	%	n	%	n	%	n	%
2006	448	30.6%	528	36.1%	488	33.3%	1464	100
2008	242	26.7%	358	39.5%	306	33.8%	906	100
2010	114	16.8%	321	47.4%	242	35.8%	677	100
2012	97	18.3%	234	44.2%	199	37.5%	530	100
Total	901	25.2%	1441	40.3%	1235	34.5%	3577	100

The above mentioned analysis of Pearson correlation coefficients ( $r$ ) between all variables has led to the following results:

1. *Event Attitude* has positive moderate correlations with the ability of the event to bring a positive feeling about careers in ICT (1a) ( $r_1 = 0.360$ ) and an attitude towards presenters speaking about their experiences in ICT (1b) ( $r_2 = 0.371$ ). The 1a and 1b constructs are also strongly positively correlated with each other ( $r_3 = 0.404$ ).

2. The *ICT Interest* construct is formed by two items: the interest in ICT after attending the event (2a) and an interest in ICT subjects at school (2b), which have strong significant correlation with each other ( $r_4 = 0.607$ ) and with *Event Attitude* ( $r_5 = 0.592$  and  $r_6 = 0.411$  respectively).

There is also a moderate positive correlation between 2a and 1a ( $r_7 = 0.384$ ).

3. The *ICT Intention to Learn* construct is again formed by two items, namely an intention to find out more about ICT (3a) and an intention to select ICT based subject at school next year (3b), which have strong significant correlations between each other ( $r_8 = 0.590$ ), 2a ( $r_9 = 0.667$  and  $r_{10} = 0.599$  respectively), as well as 2b ( $r_{11} = 0.429$  and  $r_{12} = 0.470$  respectively).

*Event Attitude* has a strong positive correlation with 3a ( $r_{13} = 0.468$ ) and a moderate positive correlation with 3b ( $r_{14} = 0.377$ ). There is also a moderate positive correlation between 3a and 1a ( $r_{15} = 0.352$ ).

4. *ICT Career Intention* (our target dependent construct) has strong positive correlations with both the *ICT Interest* and the *ICT Intention to Learn* constructs, namely with 2a ( $r_{16} = 0.596$ ), 2b ( $r_{17} = 0.421$ ), 3a ( $r_{18} = 0.573$ ), and 3b ( $r_{19} = 0.535$ ).

*ICT Career Intention* has also moderate positive correlations with *Event Attitude* ( $r_{20} = 0.336$ ) and 1a ( $r_{21} = 0.308$ ).

In order to test the developed model (see Figure 1), we exploited the PLS path modelling algorithm (Marcoulides et al. 2009), which includes the following steps:

First, significance of the relationships between the items and their corresponding constructs, namely between *ICT Interest* and 2a, 2b, as well as *ICT Intention to Learn* and 3a, 3b, were tested. The constructs *Event Attitude* and *ICT Career Intention* have only one item, so the test is not relevant for them. The test was performed by bootstrapping the original dataset with 500 samples. The results show that all the relevant  $t$ -values were far above 3.29, which indicated their significance at  $p$ -value less than 0.001 (see Table 2).

Table 2.  $t$ -Statistics and Path Coefficients

	$t$ -Statistics	Path Coefficients
<i>ICT Interest</i> --> <i>ICT Career Intention</i>	62.53	0.37
<i>ICT Intention to Learn</i> --> <i>ICT Career Intention</i>	21.14	0.39
<i>ICT Interest</i> --> <i>ICT Intention to Learn</i>	84.49	0.69
<i>Event Attitude</i> --> <i>ICT Interest</i>	48.53	0.59

Then the strength of influence of items on corresponding constructs (again, relevant only for multiple item constructs *ICT Interest* and *ICT Intention to Learn*), as well as the strength of influence of the related constructs



on each other were checked. All relevant factor loadings in the outer model are far above 0.71 and, therefore, satisfy the requirement of discriminant validity (Fornell and Larcker 1981). All path coefficients in the inner model are also quite strong, especially between *ICT Interest* and *ICT Intention to Learn* (0.697), as well as between *Event Attitude* and *ICT Interest* (0.589) showing very strong direct influence between these constructs (see Table 2).

The coefficient of determination ( $R^2$ ) of our target variable *ICT Career Intention*, i.e. the proportion of variability in a data set that is explained by the statistical model (Steel and Torrie 1980), is quite high (48.4%). For *ICT Intention to Learn* the  $R^2$  is 48.6% and for the *ICT Interest* the  $R^2$  is 34.73% (see Table 3). As *Event Attitude* is not predicted by any other variable in our model, its  $R^2$  equals zero.

Table 3. Coefficients of Determination, Cronbach's Alpha and Cross Loadings

	$R^2$	Cronbach's Alpha	Cross Loadings					<i>Event attitude</i>
			<i>ICT Career Intention</i>	<i>ICT Interest</i>		<i>ICT Intention to Learn</i>		
				2a	2b	3a	3b	
<i>ICT Career Intention</i>	0.48	1	1	0.64	0.49	0.56	0.57	0.37
<i>ICT Interest</i>	0.35	0.79	0.64	0.93	0.88	0.62	0.60	0.59
<i>ICT Intention to Learn</i>	0.49	0.71	0.64	0.71	0.54	0.88	0.88	0.48
<i>Event Attitude</i>	0	1	0.37	0.62	0.43	0.46	0.38	1

The internal consistency reliability (ICR) of each construct was assessed by Cronbach's alpha test. The ICR of *ICT Career Intention* and *Event Attitude* is above 0.9, so can be considered as excellent (Hinton et al. 2005). Other variables, *ICT Interest* and *ICT Intention to Learn* have high alpha values between 0.7 and 0.9 (Hinton et al. 2005). Therefore, the items measure the corresponding constructs (see Table 3).

The Cross Loadings Coefficients test checks whether the items load the most to the related latent variables, which is fulfilled in our model: the items 2a and 2b load the most to *ICT Interest* and 3a and 3b – to *ICT Intention to Learn*. As *Event Attitude* and *ICT Career Intention* are single-item constructs, the loading for them equals 1. It is important that the difference between an item loading to a related latent variable is at least 0.2 more than loadings to any unrelated latent variable, which is true in our case (see Table 3).

Thus, all relationship in the model are statistically significant and strong, all the constructs built have high ICR. Therefore, our hypotheses *H5* and *H6* that *ICT Interest* and *ICT Intention to Learn* have a positive influence on *ICT Career Intention* are validated (see Table 4). A hypothesis *H1* that the *Event Attitude* has a positive influence on *ICT Career Intention* is partially validated, as an indirect influence via *ICT Interest* was proved.

Table 4. Hypotheses Testing Results

Validated	Rejected
<i>H1</i> (indirect influence), <i>H5</i> , <i>H6</i>	<i>H2</i> , <i>H3</i> , <i>H4</i>

Based on the results achieved, we can argue that Interventions have an indirect positive influence on ICT career intentions (RQ2) by directly influencing the general interest in ICT, which, in turn, has a direct positive influence on ICT career intentions (RQ1). Another factor derived from the data available, which positively influences ICT career intentions, is the intention to find out more about ICT after the Event (RQ1).

## LIMITATIONS AND FUTURE RESEARCH

Our study has a number of limitations, which are also the subject for future research. First of all, it is data-driven, not model-driven. The analysed questionnaire was initially developed to evaluate the Event enabling organisers to improve the running of the program; not to test our research model. Therefore, for future Events we will perform a major revision of the questionnaire and will include more questions to test other factors, which might have a significant influence on ICT career intentions. The new set of questions will be informed by other comparable studies and theoretical propositions in the literature (such as the model of Adya and Kaiser, 2005): e.g. more attention would be given to the influence of role models and gender stereotypes coming from family, peer group, media and teachers. Another important set of questions should address the *Non Takers* and

*Newcomers* categories on the reasons why they intend to select careers outside ICT (*Non Takers*) or why they did not consider ICT as a career option before the Event (*Newcomers*).

The updated questionnaire should also contain more closed questions and fewer open-ended questions. The reason for doing this is that schoolgirls fill in the open questions very reluctantly – more than a quarter of responses to the open-ended questions are missing (25.4%) compared to 9.5% missing values for the closed-ended questions. We have already discussed that some open questions can easily be transferred to closed ones to avoid biased interpretation of the responses, e.g. a tick box for indicating a favourite session instead of free text. The improved questionnaire can then be used to evaluate similar Interventions for girls in other countries forming a cross-cultural comparative study.

Second, more empirical evidence is required to confirm our assumption that career intentions lead to career choice. Up to now we could only find conceptual propositions in the literature. A longitudinal study of the girls who participated in one of the Events would be very valuable. Here we also assume that an intention to choose a career in ICT is a necessary, but not sufficient, factor for making a final choice in favour of this field for studies and work. We call for empirical testing of other possible factors influencing ICT career choice taking e.g. the Adya and Kaiser (2005) model as a basis. Such a survey could be enhanced by involving females who already study or work in the ICT field.

## CONCLUSION

There are strong arguments that having diversity in business and technology decision-making in organizations enables new kinds of innovation and is significantly beneficial, both economically and through increased productivity (e.g. Craig et al. 2013). According to the National Center for Women & Information Technology (NCWIT), gender diversity is of importance to the computing industry as diversity: “expands the employee pool; improves the bottom line, enhances innovation; [and] promotes equality” (DuBow 2011). However in the ICT field women continue to be underrepresented (e.g. European Commission 2012). This article also highlights the lack of skilled personnel that will be available to fill the needs in the ICT industry in the next decade (e.g. Ashcraft and Blithe 2010).

One possible strategy to tackle these challenges is to invite schoolgirls to attend events aimed at promoting ICT education and career opportunities. This paper critically reflects and evaluates the contribution of one such Event, namely “*Go Girl, Go for IT*”, and investigates its influence on ICT career intentions using quantitative analysis of survey data with PLS method. The results of our survey confirm the success of the Event with more than 90% of the respondents reporting a positive feeling about careers in ICT after the Event. At the same time, we would like to raise a concern that we observed a constant decrease in the amount of Event participants in 2006-2012. As mentioned earlier, the girls are usually invited by their ICT teacher, but the trend is that each year there are fewer teachers who can do it, as less computing classes are being offered at secondary school. We call for action to improve this situation, as our results show that interest in ICT subjects at school is crucial in forming intentions to choose ICT as a future career.

In our study we introduced three categories of girls’ attitude towards careers in ICT (*Non Takers*, *Newcomers* and *Takers*). Based on the findings, we argue that if we can influence the *Non Takers* to spend more time with technology and become *Newcomers*, then we may shift the cycle of non-participation in ICT. This is an iterative cycle in that we propose that *Newcomers* can become *Takers* through many positive messages about women in technology from a range of sources, within a range of environments.

We also show that Interventions have significant influence on interest in ICT which, in turn, affects ICT career intentions. Contradictory to the Adya and Kaiser (2005) model, we uncovered that same-sex education environments, frequency of computer usage, and the purpose of usage (e.g. for building websites or programming) do not have an influence on ICT career intentions.

We need many different intervention programs for schoolgirls to engage in at different times in their young lives to give them many positive experiences and a wide variety of information about working with technology. Fisher and colleagues (2009) identify impacts on the sphere of influence and the Event discussed in this study is just one such sphere. We would like to further understand ICT career intentions and plan to test the developed model at future Events and other Interventions. We also argue that in part due to the voluntary nature of these events, some limitations are evident. It is important to note that organisers and presenters are not paid directly for their efforts and are often not financially supported for their involvement in the event. This is in part due to the lack of continual support from one well-funded organization like the National Science Foundation or NCWIT in the U.S. Such events rely on industry funding and the volunteer time of those involved. As such, it is argued that more consistent and substantial funding could aid the better organisation, planning and implementation of these interventions.

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