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ICT and Women's Empowerment in Egypt: An Empirical Study

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ABSTRACT

Studying the Digital Gender Divide in African countries, including Egypt, is considered vital for social and economic development. It is an established fact that one of the UN Millennium Development Goals is gender equality and the empowerment of women. Information and Communication Technology (ICT) can be the vehicle to achieve this goal. This study applies econometric techniques to shed some light on the impact of ICT ownership on the gender divide, and how ICT can play an effective role in empowering women in Egypt. Furthermore, the effect of ICT on women's lives in relation to other relevant factors such as education, income and geographic location is also investigated. Finally, recommendations are provided to the policy maker to enhance gender equality in Egypt through increasing the role of ICT in empowering women. The contribution of this paper is the introduction of an ICT ownership index from the sample data ELMPS06, as well as the introduction of a women's empowerment index. Results reveal that the ICT ownership index is largely influenced by education and gender, while the ICT ownership index has a significant impact on women's empowerment in Egypt. However in the obtained results, controlling for other individual characteristics like women's occupation and economic activity, the ICT ownership index becomes statistically insignificant.

Keywords: Egypt, gender inequality, ICT, ICT ownership, women's empowerment

JEL Classifications: J16, L86

INTRODUCTION

Information and Communication Technology (ICT) plays a critical role in today's society. In Africa and specifically Egypt, the subject of this study, access to the Internet and other forms of ICT, like the mobile phone, PC and television, varies from men to women users, and between urban and rural communities. This has been attributed to the existing gender inequality between men and women, such that the implementation of ICT in society exerts,

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and sometimes exacerbates, the same divide in ICT usage patterns between men and women.

The Egyptian government is giving great attention to transforming Egyptian society into a knowledge-based society. This includes the uptake of high-speed internet access and e-applications. As a result, ICT initiatives have been launched, including the 'PC for every home' initiative, the free internet initiative and e-strategies. However, the inequality in access, generally called 'the digital divide', still exists along the lines of gender inequality or the gender divide. This is considered an unexpected outcome of technological change, since it was assumed that ICT would empower women and enhance their role in today's economy (World Bank 2004, United Nations 2005).

Women's empowerment (Roushdy, 2009) refers to the economic empowerment of women, as women's empowerment is a proxy for five dimensions: women's share in household decision–making, access to cash, mobility and exposure to violence, and gender role. The women's empowerment index is constructed based on data from the ELMPS06 survey using the simple sum method. This study also introduces the ICT ownership index, which has been constructed using the Principal Component Analysis (PCA) technique and simple sum method.

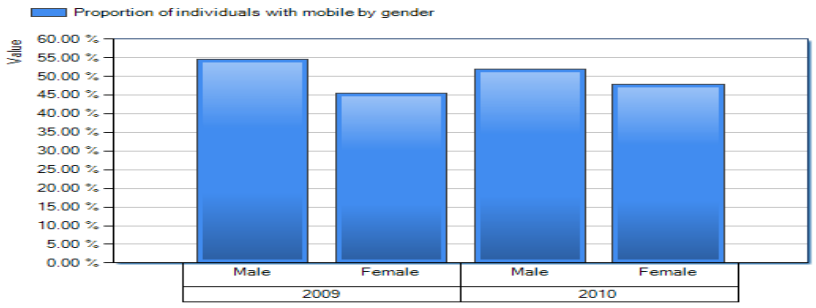
It is worth mentioning that from the theoretical perspective, the diffusion of innovations theory by Everett Rogers also sheds some light on the adoption of ICT products. So, on the micro level, the newness and unfamiliarity of an innovation lead to cost-benefit analysis with a large dose of uncertainty. Since people are on average risk averse, the uncertainty will result in delaying the decision to adopt or use this ICT product (innovation) till later (Orr, 2003).

A critical motivation of the present study is the documented gender gap in ICT access and use (Ministry of Information and Communication Technology, MCIT). The ICT digital divide trend is well documented in official statistics published by (MCIT) in Egypt. As depicted in Fig.1, the proportion of males with mobile phones is much higher compared to females with mobile phones in both 2009 and 2010. This may be due to the fact that the income of males for the two years is higher when compared to that of females.

The same ICT gender divide is documented in Fig.2, where it is revealed that users of public points of access, such as IT clubs, are mostly males. This can be explained by customs and traditions that can prevent females, especially in rural areas, from visiting public ICT clubs and using the Internet outdoors in a public place.

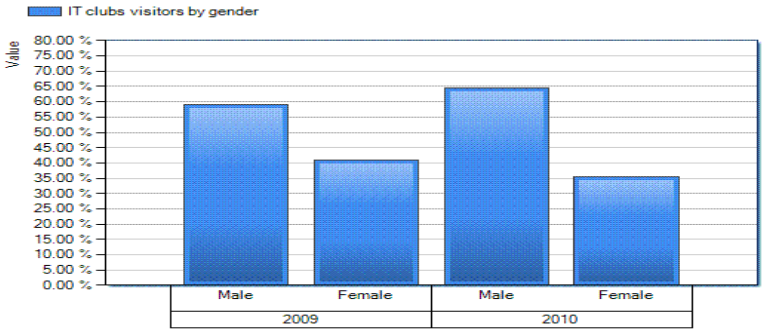
In Fig.3, the gender gap in the use of ICT, specifically the Internet, is quite clear over the period 2008-2012. Internet use is divided across gender lines, as males use the Internet significantly more than females (54 % males compared to 46 % females in 2012) as depicted in Fig.3,

As indicated in Fig.4, the statistics also reveal that males in urban areas are the heaviest Internet users, followed by male



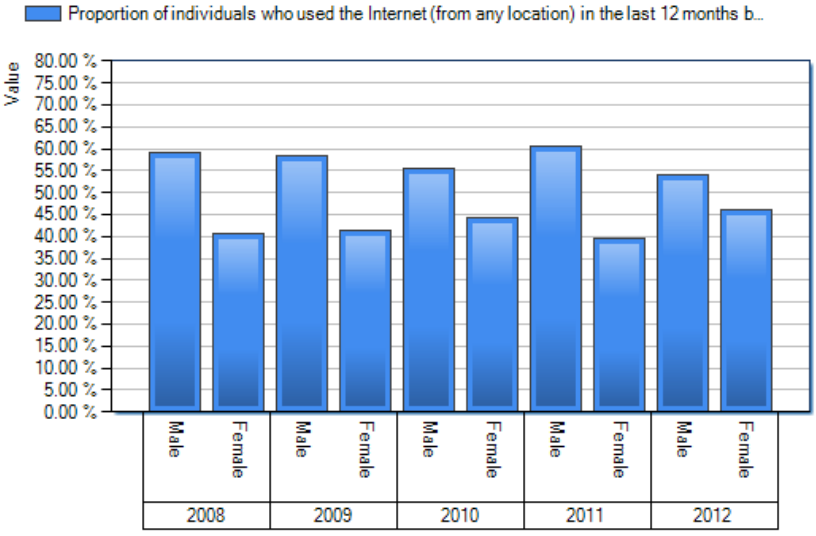
Source: Ministry of Communication and Information Technology, Egypt

Fig.1: Proportion of Individuals with Mobile Phones by Gender (2009, 2010)



Source: Ministry of Communication and Information Technology, Egypt

Fig.2: IT Club Visitors by Gender in 2009 and 2010



Source: Ministry of Communication and Information Technology (MCIT), Egypt

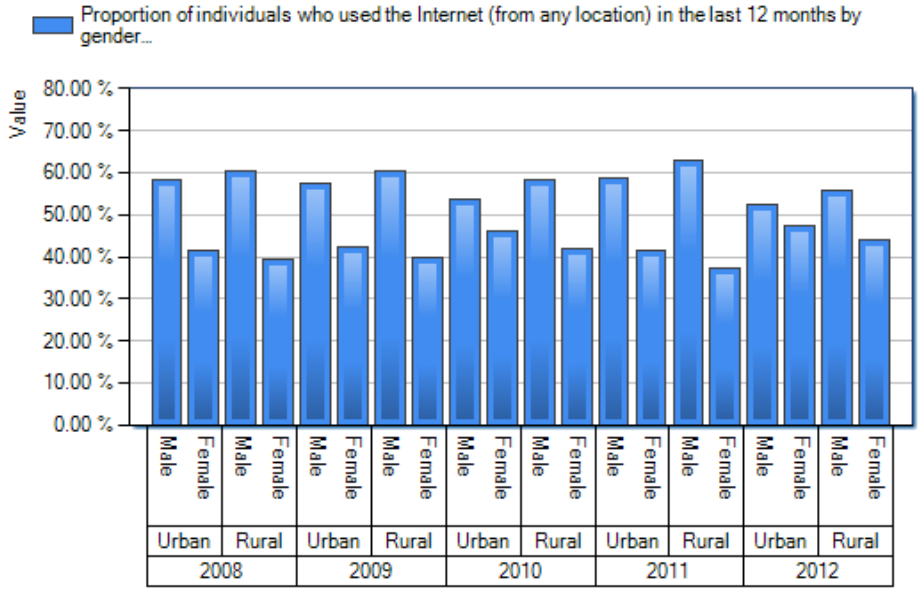
Fig.3: Proportion of Internet Users by Gender in 2008-2012

users in rural areas, while females in urban areas show a much higher rate of Internet use than females in rural areas in 2008. In 2012, the statistics show that males in rural areas were the heaviest users compared to males in urban areas.

This study aims at presenting policy makers with recommendations regarding the role of ICT in women's empowerment in Egyptian society using econometric techniques. Eventually, these recommendations can also be extended to other African and Arab countries.

The problem of the gender digital divide presents the inequality of access and use of ICT between males and females. This paper investigates the hypothesis that gender neutral ICT policies may have exacerbated the digital gender divide in Egypt. In this paper, I will focus on investigating the determinants of ICT access and use for females in Egypt, and the role that ICT actually plays in empowering women in Egypt. Thus, women's empowerment in the context of my paper entails empowering women through ICT ownership and access to overcome challenges and to increase their economic participation in society.

This paper is divided into four main sections. The first section highlights the main themes in the literature. This is followed by the methodology and the empirical study that is divided into data sources, data analysis, the empirical model and methodology. Finally, the conclusion and policy recommendations are presented based on the obtained results.



Source: Ministry of Communication and Information Technology (MCIT), Egypt

Fig.4: Proportion of Internet Users by Gender and Location in 2008-2012

LITERATURE REVIEW

There are limited studies about ICT and women's empowerment in Egypt and Arab countries in general. One of the few studies available is the study by Al Senaidi *et al*. (2009), which investigates the barriers in adopting information and communication technologies in higher education in Oman. Their conducted survey shows five effective problematic factors including the lack of equipment and lack of institutional support as well as lack of awareness of ICT benefits, lack of confidence and lack of time. Another study focusing on South Africa by Dlodlo (2009) examines the impact of socio-economic factors on girls and women's access to ICT education and training in rural South Africa, and provides recommendations for the improvement of girls and women's access to ICT education and training in rural South Africa. There are a number of studies that tackle this issue in developed countries. Imhof *et al*. (2007) present a sample of 48 university students (23 males and 25 females) who were chosen for a survey on computer access, recorded a user diary, and a technology self sufficiency questionnaire and a computer task in Holland. Their results show that the gender gap is closing with respect to computer access and self efficiency, and give suggestions for creating computer-based learning environment.

However, another study by Meelissen *et al*. (2008) reveals that in Western countries the participation of females in ICT professional careers is not only low, but is also still falling. In fact, most of the research on gender and computing has been focusing on the influence of non-school related factors. Therefore, there is little empirical evidence that schools or teachers are able to influence girls' attitude towards ICT. However, multi-level analysis shows that most of the variance in computer attitude is explained by non-school related factors.

On the other hand, according to Kelan (2007), current changes in gender relations show that the presence of women in ICT work has increased. However, women, still form a minority in this sector. In this article, discourse analysis is used to illustrate the resources to which the workers have access and to explain the scarcity of women in ICT work. The paper shows that women in the UK still constitute a minority in the ICT sector compared to men. The different discursive strategies discussed include attributing the scarcity of women in ICT work to factors over which the employer has no control, such as socialisation, biology and women's disinterest in changing technology. Based on substantial gender and development literature, Gillard *et al*. (2007) emphasise the role of gender and demonstrate the centrality of gender in understanding the information systems of developing countries, considering the relationship between gender, ICT and globalisation. Moreover, the United Nations (2005) indicates that the gender divide is observed where women and girls enjoy less access to information technology than men and boys. This also provides historical background on increasing attention to gender equality and ICT, and confirms the

importance of addressing the gender divide. Reviewing the literature on the use of ICT, we observe that one of the main themes discussed in the literature on this topic is the determinants of ICT adoption and diffusion for women, and how it is different from other factors that affect other groups in a typical society. In addition, we observe the existence of numerous models that aim to explain the adoption of ICT by various groups, including women. There are some models used to explain this trend, namely, the "Task Achievement Model" (Sainz *et al*., 2009), the "Technology Acceptance Model (TAM)" (Davis *et al*., 1989), the "utility in the acceptance model" (Verdegem *et al*., 2009) and the "heterogeneity models" (Rosenberg, 1972).

The lack of 'computer attitudes' plays a major role in women's low participation in technology (Sainz *et al*., 2009). Previous studies point to the consensus that the early teenage years are an important phase that reflects how young people perceive friends' and neighbours' views about them. This impacts their career choices quite strongly. Girls tend to select less technical subjects and specialties than boys during adolescence as girls tend to choose subjects within the Humanities and Social Science domains when preparing for their professional careers. In Egypt, for example, females with secondary or higher education were estimated at only 33.5 % in 2006. (Central Agency of Public Mobilization and Statistics, Census for Population and Houses, 2006).

There are other significant factors that influence computer attitudes and ICT adoption in general. For instance, the literature indicates that the nature of the occupation of the mother is an important factor in moderating gender differences concerning computer attitudes as it makes visible the contribution of women in the workforce. Mothers with no occupation outside the home will limit their children's use of computers to a higher extent than those mothers who have an occupation outside the home (Rosenberg, 1972).

Moreover, the literature indicates that the geographical location and place of origin is also another factor that is important, as social relationships play an important role in rural environments. Thus, girls from rural areas value social skills more positively than teenagers from other areas. This could be a result of the salient influence of social skills in rural environments where proximity and close relations are more typical than in urban areas (Sainz *et al*., 2006).

Furthermore, the literature indicates that social class, which is most probably related to income level, is another important factor affecting attitudes towards computers, as teens from lower social classes with low income levels tend to use computers less frequently than teens from intermediate and upper social classes with relatively higher income levels. These findings are in line with the ones observed by OECD (2005), where socioeconomic background was found to be a stronger predicator than gender of whether or not a student had access to a computer at home.

Verdegem *et al*. (2009) discuss several factors and determinants that explain differences in ICT adoption, including gender, age, education and family structure. The gender factor implies that men enjoy greater access to ICT and use ICT more than women. The age factor implies that increased age is associated with lower levels of access, limited modes of use and patterns of connecting. The education factor implies that lower levels of education correspond with divides related to access and use of ICT. Finally, the family structure factor implies that the presence of school-age children tends to increase contacts with ICT. Other variables that affect the use of ICT include race, urban / rural location and cultural participation.

Another study highlighted the importance of any e-inclusion policy to include Internet access for all as inequalities in ICT adoption and usage are not likely to diminish or disappear on their own (Verdegem *et al*., 2009). Overcoming digital inequalities is now considered to be one of the key drivers for social and economic welfare in order to improve social participation and to increase competitiveness and productivity. Income status remains one of the most important factors explaining differences in ICT adoption and usage (Martin *et al*., 2007). Even in highly industrialised societies, lower levels of income are consistently shown to be associated with ICT inequalities (Verdegem *et al*., 2009, Rice et al., 2003; Vahovar *et al*, 2006).

Therefore we can conclude that there exists a knowledge gap in this area of research in Africa and especially in Egypt. Some of the relevant literature that pinpoints to the impact of ICT on women in other regions of the world has been highlighted; especially the studies that shed some light on the significant factors that impact ICT adoption in females. These determinants are the main focus of this study.

METHODOLOGY AND EMPIRICAL MODEL

Data Sources

A cross-sectional data set for men and women for the latest available data for the year 2006 has been obtained from "The Egypt labour market panel survey of 2006" (ELMPS 06). This data set is for public access and the survey was sponsored by the Population Council, Economic Research Forum and Central Agency of Public Mobilization and Statistics, Census for Population and Houses (Capmas). The two Egypt Labor Market Surveys (ELMS's 1998 and 2006) are nationally representative surveys. The ELMPS06 is a follow-up survey to the Egypt Labor Market Survey of 1998 (ELMS 98), which was carried out in November-December 1998 by Economic Research Forum (ERF) in cooperation with the CAPMAS. ELMS 98 was carried out on a nationally-representative sample of 4,816 households. The ELMPS 06 is the second round of what is intended to be a periodic longitudinal survey that tracks the labour market and demographic characteristics of

the households and individuals interviewed in 1998 as well as any new households that might have formed as a result of splits from the original households and provides a refresher sample of households to ensure that the data continue to be nationally-representative. The field work for ELMPS 06 was carried out from January to March 2006.

The final sample of 8,351 households is made up of 3,684 households from the original ELMS 98 survey, with 2,167 new households that emerged from these households as a result of splits and a refresher sample of 2,498 households. Of the 23,997 individuals interviewed in 1998, 17,357 (72 %) were successfully re-interviewed in 2006, forming a panel. The 2006 sample contains an additional number of 19,743 "new" individuals. Of these 2,663 individuals joined the original 1998 households, 4,880 joined the split households and 12,200 were part of the refresher sample of households. Data Sources include cross-sectional data sets for men and women for the year 2006 obtained from "The Egypt Labor Market Panel Survey of 2006" (ELMPS 06). Descriptive Statistics are found in Appendix 1.

The Empirical Model

In this study the following 2 models will be estimated using Ordinary Least Square:

$$\begin{aligned}&\text{ICT own index}\\&= \beta_0 + \beta_1 \text{edu} + \beta_2 \text{ gender} + \beta_3 \text{ age}\\&\quad - \beta_4 \text{ age}^2 + \beta_5 \text{ real monthly wage}\\&\quad + \beta_6 \text{ region} + \beta_7 \text{ employment status}\\&\quad + e \qquad (1)\end{aligned}$$

$$\begin{aligned}&\text{Women Empower index}\\&= \beta_0 + \beta_1 \text{ ICT own index} + \beta_2 \text{ age}\\&\quad - \beta_3 \text{ age}^2 + \beta_4 \text{ real monthly wage}\\&\quad + \beta_5 \text{ Empl status} + \beta_7 \text{edu} + \beta_8 \text{ region}\\&\quad + e \qquad (2)\end{aligned}$$

The ICT Ownership Index is formed and used as the dependent variable. It consists of the following questions covered in the ELMPS 06 survey:

- Do you own a telephone?
- Does your family own a colored TV?
- Does your family own a personal computer?
- Does your family own a mobile phone? and
- Does your family own a satellite dish?

The values of the ICT Ownership Index scale range from 1 to 100, where the minimum value of the index indicates that the individual does not own ICT products or goods, and the maximum value means that this person owns all the ICT products. So, the more ICT products one owns, the higher the value of the index will be (summary statistics are presented in Table 1, which is given in the Appendix). The ICT Ownership Index was created using 2 methods: The Principle Component Analysis technique and the Simple Sum technique. Both of them will be explained in the methodology below.

Methodology of Construction of the ICT Ownership Index and the Women's Empowerment Index

In the Simple Sum methodology, all the indicators that constitute the index, namely

TABLE 1
Coefficients of the Principal Component Analysis

Variables	Coefficients		
	Urban	Rural	All Egypt
Fixed Phone	0.4074	0.4225	0.4138
Computer	0.4685	0.4045	0.4504
Mobile	0.515	0.4928	0.5084
Dish	0.4634	0.4744	0.4606
Colour T.V.	0.3669	0.4358	0.3941

ownership of a fixed phone, mobile phone, personal computer, satellite dish and coloured TV, are aggregated with equal weights. The Principal Component Analysis (PCA) technique can be used effectively to obtain the most appropriate weights for the indicators of the proposed indices and sub-indices, such that the extracted first principal components would explain the largest percentage of total variance captured by this component. Principal component analysis (PCA) is a multivariate technique that analyses several inter-correlated quantitative dependent variables. Its goal is to extract the important information to represent it as a set of new orthogonal variables called principal components (Abdi *et al*., 2010). Thus the objectives of the PCA are to reduce dimensionality of the data and to construct a new measurable index.

The Women's Empowerment Index is also constructed with the Simple Sum method, focusing on the following five dimensions: 1) women's share in household decision-making; 2) access to cash; 3) mobility; 4) exposure to violence; and 5) gender role, all of which are covered in ELMPS06 Survey. The minimum value of the index is 0 and the maximum value is 38.

Analysis of both regression models using the Simple Sum methodology

Both regressions are multiple regression models which really estimate a quadratic function as it includes age in a quadratic form, using the ordinary least square method of estimation.

The first regression model has been formulated as follows

$$\text{ICT own index} = \beta_0 + \beta_1 \text{edu} + \beta_2 \text{ gender} + \beta_3 \text{ age} - \beta_4 \text{ age}^2 + \beta_5 \text{ real monthly wage} + \beta_6 \text{ region} + \beta_7 \text{ employment status} + e \quad (1)$$

The ICT Own Index is the ICT Ownership Index and it reflects the ownership of ICT assets. There are two specifications for the first model: the short model and the expanded one. In the short model, the explanatory variables include education, gender (dummy variable), age, age squared (in order to capture the nonlinearity of the age), real monthly wage, region (dummy variable) and employment status (dummy variable). An expanded model was also estimated, which includes in addition to the explanatory variables controlled for earlier,

more variables that reveal the characteristics of the individual, such as occupation, sector (public / private) and economic activity. **Using the Simple Sum** methodology, we estimated the following equations, both for the short and the expanded models. The results are provided below:

In the short model, the dependent variable is the ICT Ownership Index and the explanatory variables are education, gender, age and age squared, employment status categories (wage worker, employer, self employed, unpaid family worker), region categories (Greater Cairo, Alexandria, Suez; and Urban Lower, Urban Upper, Rural Lower, Rural Upper) and real monthly wage as a proxy for income, all of which are significant. All levels of education are statistically significant and positively affect ownership of ICT assets.

Age had the expected sign as well as the economic impact on ICT ownership, which is non-linear. In order to capture the non-linearity of age as an independent variable on ICT ownership, we controlled for age as well as age squared, which both resulted in significant coefficients where the effect of age on the ICT Ownership Index diminishes as age increases. The coefficient of age squared had a negative sign, indicating this phenomenon.

In the short model, the employment status dummy variable indicates that compared to the base group of wage workers, all the employment status groups are statistically significant. Using the standardised beta coefficient, the unpaid family worker such as the housewife, is the one who impacts the ICT Ownership Index or owns more ICT assets compared to the wage worker. This can be justified if the housewife uses a mobile phone and home computer etc. to empower herself.

Furthermore, we added new explanatory variables in the expanded model. All the added variables are for economic activity (dummy variables). All the economic activities are statistically significant and with expected positive sign. Thus, doing an economic activity compared to agriculture has a positive impact on ICT ownership. The private sector has a negative impact on ICT ownership compared to the government or public sector. This is explained by the discrimination that women face in the private sector as it provides fewer job opportunities for female employees compared to the government sector.

Women's Empowerment Index

$$= \beta_0 + \beta_1 \text{ ICT index} + \beta_2 \text{ age } 0{,}0625 \text{ in } \beta_3 \text{ age}^2 + \beta_4 \text{ real monthly wage} + \beta_5 \text{ Empl status} + \beta_7 \text{edu} + \beta_8 \text{ region} + e.*$$

*where **e** is the error term or the disturbance term and it follows a standard normal distribution

In the second regression, the Women's Empowerment Index, as described earlier, was regressed on the following explanatory variables: ICT Ownership Index, age, real monthly wage, employment status (dummy variable), education (dummy variable) and region (dummy variable). In the expanded model we added the women's occupation (dummy variable), economic activity

(dummy variable) and sector (public / private) (dummy variable).

The findings indicate that the ICT Ownership Index positively affects the Women's Empowerment Index and is statistically significant. However, it was not expected *a priori* that the sign of the index be positive, as it indicates that there would be a closing of the gender gap when it comes to owning the ICT essential products, such as fixed telephone lines, cell phones, computers and satellite dishes. However, in the expanded model, where we control for other female characteristics, the ICT ownership index is statistically insignificant. This is due to the digital divide that exists along the gender lines, which is evident from the data obtained from the Ministry of Communication and Information Technology (MCIT) in Egypt. In addition there are specific barriers to women's access (Huyer *et al*., 2003) and use of ICT. These include high levels of illiteracy and lack of education, which is needed to be able to use ICT products like the Internet. Moreover, women have less time to spend online as they have a triple role in domestic and community management and productive responsibilities. Women usually have fewer financial resources compared to men to cover the costs of access and equipment. In terms of geographical location, in developing countries women tend to live in rural areas more than men. Thus, they have access to only low quality infrastructure, and travel to ICT centres is much more costly and time consuming; these are serious disadvantages. Real monthly wage as a proxy for income is statistically significant and has a positive impact on the Women's Empowerment Index. The model overall is statistically significant as the p –value for the F-statistics is zero. This means that the variables as a group explain the model. R-squared is low; however, this is understandable and accepted in social empirical studies.

Occupation has a negative impact on women's empowerment compared to elementary occupation. This is unexpected, since having an occupation should actually have a positive significant impact on owning an ICT product. This sheds light on the role of gender gap at work as it reduces the empowerment of women. All occupations have a negative impact on women's empowerment compared to elementary occupations, and are statistically significant except for professionals. On the other hand, Professionals consist of a small percentage of the sample and the percentage occupied by women is lower in this category. This explains why they are statistically not significant.

Comparing the short and the expanded model, we find that R-squared increased when we added new variables, although not by very much. This indicates that these variables are not really important. However, these added variables, namely, occupation, economic activity and sector, eliminate the significance of ICT ownership. For the short model, on the other hand, the ICT ownership model has a positive effect, and is statistically significant on women's empowerment. Using the second method, which is the Principle Component Analysis

(PCA), we find the results of the short model consistent with the first method. So the PCA method serves as a robustness check for the estimated model. Both the ICT ownership regression and the women's empowerment regression show similar results to the first model, which uses the method of simple sum.

CONCLUSION AND POLICY RECOMMENDATIONS

The results obtained from the empirical study reveal that the ICT Ownership Index is largely influenced by education and gender, while the ICT Ownership Index has a significant impact on women's empowerment in Egypt. However, controlling for other individual characteristics such as women's occupation and economic activity, the ICT Ownership Index becomes statistically insignificant with no impact on women's empowerment. The contribution of this paper is the introduction of an ICT ownership index from the sample data ELMPS06 as well as the introduction of a women's empowerment index. Another important contribution of this study is the innovative use of the ELMPS 06 dataset to measure the impact of ICT on women's empowerment in Egypt.

Thus, according to the diffusion of innovations theory, the ICT innovations highlighted in this paper have to a certain extent reached the tipping point as far as women's empowerment in Egypt is concerned. However, when we control for other variables such as women's occupations, the results change and it seems that women are in the early-adopters phase. Accordingly, there is ample room for ICT to mainstream gender equality in Egypt. According to the diffusion in innovations theory, this can be achieved by the mass media and persuasion by opinion leaders in Egypt. Promoting ICT training, encouraging ICT-related employment and increasing ICT access and usage for women are all means to increase ICT immersion. All these policies that are related to ICT would further empower women and reduce the gender gap that exists in Egypt as well as in many other countries. Empowering women to become participants in a knowledge-based society is a perquisite to increasing development in Egypt and elsewhere. Tele-working, call centres, the software industry and offshore services all call for more IT education and training in all levels of education, which would enhance girls, and later women, to become active contributors to the Egyptian economy's growth and development. This study has proved that, to a large extent, ICT is empowering women in Egypt; this is eclipsed only when we add the impact of other variables such as women's occupation and economic activity.

In Egypt, at the macro-level, supposedly 'gender-neutral' ICT policies regarding education, training and price structure may have an unintended negative impact based on gender roles and access to ICT resources. In urban areas, there is a high percentage of ICT infrastructure ownership like personal computers and mobile phones for females. However, female usage of computers is still less than that of males and mobile-phone ownership is also less as documented by

the Egyptian Ministry of Information and Communication Technology (Thas *et al*., 2007).

There are, nevertheless, attempts to benefit from ICT and to use it as a means to empower women in Egypt. In rural areas, where females face major obstacles to education and usage of ICT, there are new ways that NGOs working under the umbrella of the Egyptian government are targeting the problem of the digital divide and using ICT to empower women. The initiative of ICT4IE7, "using ICT, namely Internet and multimedia, for illiteracy eradication," has had a great impact on rural communities in Egypt. Instead of going to schools, young girls take home-lessons with the help of computers and CD-ROM multimedia. It also assists mothers in raising their children and helping them in attaining their education.

Working women were considered the main beneficiaries of ICT in clerical jobs. Thus women were introduced to computers in their offices to perform simple tasks. One of the occupations that women tend to have, and in which ICT is being sought as a vehicle to assist in its development, is in the production of handmade goods. The original idea was that ICT could actually open new markets and increase profits for Egyptian craftswomen and artisans. However, research attributed the failure of this idea to failure in other aspects of the production of the final goods such as in design and quality, and not the usage of ICT in marketing. Nevertheless, the internet was considered as a viable resource for some of the craftswomen, by continuing their education and increasing their skills to include computer and internet skills. This improved their income level, and qualified them to advanced clerical jobs or to supervise other craftswomen. These craftswomen, however, would typically stop their production of crafts. So, we refer to this process as "making up the ladder to additional education" (Hassanin, 2009).

Comparing the above-mentioned attitudes towards ICT and the Internet with those of advanced countries such as the USA, we find that by 2001 US women and men were equally likely to be online (Losh, 2003). In terms of age group, from late teens to the late 40s, women are more likely than men to use the Internet; men acquire an increasing edge after age 55 (DiMaggio, 2002). This study made a clear distinction between access to and use of the Internet. It found that access is much higher than usage rate, meaning that families or individuals who have access to the internet do not use it often. This is in contrast to findings from developing countries, where access of subscribers to Internet providers is much less than the actual number of users of the Internet. This reflects the fact that access for households in developing countries, such as Egypt, is still relatively expensive, while IT cafes and other public points of access are the means to increase broadband penetration in these countries (Badran *et al*., 2007).

Recommendations for policy makers, based on the results of the present empirical study, emphasise the importance of education, household type and other factors that affect women's empowerment

through ICT. Women's access to ICT can be encouraged through the following ways:

1. Public Access Strategies
2. Improving girl's and women's access to education
3. Generating demand for ICT education
4. Making IT education and training easily accessible for women and girls
5. Ensuring that women get the right skills, and
6. Providing micro-financing to women

Another aspect of the ability of ICT to empower women has been recently observed in the usage of social networks like Facebook to empower youth in general, including, of course, young females and teenagers. The latter used social networks as a platform to express their views and arrange strategies and plans to initiate discussions on political reform in Egypt. Actually, Facebook was the medium by which the recent uprising in (2011) in Egypt was organised. This sheds light on another aspect of the empowering of youth and females, that is, that it leads to their becoming politically active and politically aware, and, indeed, led to their participation in the recent political reform movement in Egypt. This paper focuses on economic empowerment of women, as women's empowerment is a proxy for five dimensions:

1. The share of women in decision-making in the household
2. Access to cash
3. Mobility
4. Less exposure to violence, and
5. Gender roles

A new dimension of women's empowerment could be added to future studies, where these studies could investigate the extent that ICT in Egypt empowered women politically i.e. the political empowerment of women, and which played a major role in the recent uprising in Egypt as well as in many other Arab countries.

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APPENDIX

TABLE 2
Descriptive Statistics

Variable	Numbers of Obs.	Mean	Std. Dev.	Min	Max
Power Index	12933	20.49	5.47	0	38
ICTurb	19658	0.00	1.46	-2.44	2.94
ICTrur	17482	0.00	1.38	-1.36	6.20
ICT Ownership Index	37140	0.00	1.42	-2.44	6.20
ICT Scaled	37140	28.27	16.48	0	100
ICT_Simple~m	37140	1.88	1.36	0	5
Education 2	30977	0.16	0.37	0	1
Education 3	30977	0.12	0.32	0	1
Education 4	30977	0.08	0.28	0	1
Education 5	30977	0.04	0.20	0	1
Education 6	30977	0.22	0.41	0	1
Education 7	30977	0.03	0.18	0	1
Education 8	30977	0.10	0.30	0	1
Age	37140	26.64	19.42	0	95
Age 2	37140	10.87	13.64	0	90.25
Gender 2	37140	0.50	0.50	0	1
Emp_Status 2	14356	0.12	0.32	0	1
Emp_Status 3	14356	0.08	0.28	0	1
Emp_Status 4	14356	0.27	0.44	0	1
Reg 1	37140	0.15	0.35	0	1
Reg 2	37140	0.10	0.30	0	1
Reg 3	37140	0.13	0.33	0	1
Reg 4	37140	0.15	0.36	0	1
Reg 5	37140	0.25	0.43	0	1
Occupation 1	14353	0.08	0.26	0	1
Occupation 2	14353	0.11	0.32	0	1
Occupation 3	14353	0.08	0.26	0	1
Occupation 4	14353	0.03	0.18	0	1
Occupation 5	14353	0.12	0.32	0	1
Occupation 6	14353	0.35	0.48	0	1
Occupation 7	14353	0.15	0.35	0	1
Occupation 8	14353	0.06	0.23	0	1
Eco_Activi~2	14347	0.00	0.05	0	1
Eco_Activi~3	14347	0.12	0.32	0	1
Eco_Activi~4	14347	0.01	0.09	0	1
Eco_Activi~5	14347	0.06	0.25	0	1
Eco_Activi~6	14347	0.13	0.34	0	1
Eco_Activi~7	14347	0.06	0.24	0	1

TABLE 2 (*continue*)

Variable	Numbers of Obs.	Mean	Std. Dev.	Min	Max
Eco_Activi~8	14347	0.01	0.09	0	1
Eco_Activi~9	14347	0.25	0.43	0	1
Sector 2	14360	0.75	0.43	0	1
mnthwgAllJob	37080	138.39	840.69	0	66240

TABLE 3
Regression Results of Simple Sum Method

VARIABLES	(1)	(2)	(3)	(4)
	Empowerment Index	ICT Ownership index Simple Sum	Empowerment Index	ICT Ownership index Simple Sum
ICT_SimpleSum	0.0726 (0.0182)		0.128** (0.0320)	
Educ2 == Literate without any diploma	1.062*** (0.0370)	0.347*** (0.0675)	1.021*** (0.0355)	0.394*** (0.0766)
Educ2 == Elementary school	0.593* (0.0251)	0.393*** (0.0870)	0.602* (0.0254)	0.446*** (0.0989)
Educ2 == Middle school	0.466 (0.0169)	0.577*** (0.0949)	0.728* (0.0949)	0.666*** (0.110)
Educ2 == General high school	0.641 (0.0111)	1.027*** (0.0723)	0.953 (0.0165)	1.203*** (0.0847)
Educ2 == Vocational high school	1.117*** (0.0861)	0.776*** (0.255)	1.534*** (0.118)	0.952*** (0.313)
Educ2 == Post-secondary institute	0.908** (0.0313)	1.026*** (0.152)	1.961*** (0.0675)	1.301*** (0.192)
Educ2 == University & above	0.461 (0.0286)	1.488*** (0.389)	1.888*** (0.117)	1.811*** (0.474)
Age	0.682*** (1.666)	0.0163*** (0.164)	0.737*** (1.801)	0.0268*** (0.270)
Age 2	-0.842*** (-1.658)	-0.00338 (-0.0273)	-0.892*** (-1.755)	-0.0120*** (-0.0967)
Sex == Female	0 (0)	0.108*** (0.0377)		
Crempstp == Employer	2.016*** (0.0531)	0.350*** (0.0831)	0.119 (0.00314)	0.235*** (0.0558)
Crempstp == Self Employed	2.508*** (0.115)	0.0738* (0.0150)	0.672** (0.0309)	0.0469 (0.00956)
Crempstp == Unpaid Family Worker	1.250*** (0.111)	0.461*** (0.150)	-0.963*** (-0.0857)	0.278*** (0.0904)
Region == Gr. Cairo	1.581*** (0.0816)	1.001*** (0.242)	1.077*** (0.0556)	1.108*** (0.268)
Region == Alx, Sz C.	1.593*** (0.0684)	0.885*** (0.181)	1.348*** (0.0579)	1.003*** (0.205)
Region == Urb. Lwr.	2.012*** (0.113)	0.458*** (0.109)	1.959*** (0.111)	0.563*** (0.134)

Region == Urb. Upp.	1.120***	0.475***	1.193***	0.555***
	(0.0692)	(0.123)	(0.0737)	(0.143)
Region == Rur. Lwr.	1.785***	0.148***	1.687***	0.168***
	(0.152)	(0.0491)	(0.143)	(0.0557)
Crocpcl == Leg.,Senior offic.& manag.	-1.860*	0.710***		
	(-0.0675)	(0.138)		
Crocpcl == professionals	-1.231	0.568***		
	(-0.0719)	(0.133)		
Crocpcl == Technic.& Assoc. Prof.	-2.201**	0.614***		
	(-0.108)	(0.119)		
Crocpcl == Clerks	-2.496**	0.608***		
	(-0.0871)	(0.0808)		
Crocpcl == Serv.& shop/market sal. wrkrs	-2.378**	0.244***		
	(-0.104)	(0.0575)		
Crocpcl == Skill. agr. & fish. wrkrs	-3.493**	0.186*		
	(-0.310)	(0.0654)		
Crocpcl == Craft & related trad. wrkrs	-2.844**	0.324***		
	(-0.106)	(0.0843)		
Crocpcl == Plant & machine operat. & assemb.	-3.012**	0.240***		
	(-0.0657)	(0.0409)		
crecac1d_86cd == Mining	0	0.510**		
	(0)	(0.0182)		
crecac1d_86cd == Manufacturing	-0.727	0.205**		
	(-0.0331)	(0.0487)		
crecac1d_86cd == Elect	0.353	0.409***		
	(0.00341)	(0.0282)		
crecac1d_86cd == Const	-2.899	0.107		
	(-0.0237)	(0.0192)		
crecac1d_86cd == Trade	-0.592	0.217**		
	(-0.0273)	(0.0534)		
crecac1d_86cd == Trans	-0.638	0.333***		
	(-0.0113)	(0.0576)		
crecac1d_86cd == Finance	0.891	0.616***		
	(0.0144)	(0.0424)		
crecac1d_86cd == Serv	0.287	0.162*		
	(0.0222)	(0.0515)		
crsector_PubPr == Private	-1.813***	-0.0870**		
	(-0.138)	(-0.0277)		
Monthly Wage (Prim.& Second. Jobs)	0.000169**	3.99e-05***	0.000207***	4.62e-05***
	(0.0289)	(0.0388)	(0.0355)	(0.0448)
Observations	4886	14303	4888	14312
R-squared	0.247	0.383	0.229	0.361
Normalised beta coefficients in parentheses *** p<0.01, ** p<0.05, * p<0.1				