Women and ICT: *exploring obstacles and enablers of a possible career*

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Abstract

The ICT industry is a key contributor to the EU's economy. Unfortunately, women's presence is low overall and it decreases as they climb the corporate ladder. Underrepresentation of women in ICT is a research area that has received attention mostly in U.S.A., UK and some European countries. This phenomenon, termed "IT gender gap", has not received much attention in Italy, yet. Therefore, the purpose of this study is doing an "initial" research and understanding the characteristics of the IT workplace culture in Italy. Based on the international research, a framework and a questionnaire have been developed. To test the questionnaire, a first research sample (without any statistical relevance compared to the Italian context) has been created and the potential respondents were contacted via email. Data analysis discusses the workplace environmental factors that hinder and support the career development of women in ICT in this country. Understanding the limitations of this research project has given rise to some open points that deserve being analysed and further explored.

Keywords: women & ICT, eSociety, gender issues in ICT

1   Introduction

The debate about a possible career for women in ICT is not new, as many studies have addressed it (Michie, Nelson, 2006), but it has not reached a satisfactory conclusion, yet. Since long both institutions (EU commission, local governments, ICT professionals' associations) and researchers have emphasized the limited presence of women in ICT jobs.

For instance, in the survey "Women Active in the ICT sector" (2013) the European Commission found that getting more girls interested in a digital career, and getting more women into digital jobs would benefit the digital industry, women themselves, and Europe's economy. According to the study, there are now too few women working in the ICT sector. While women represent 59% of all tertiary graduates and 45.7% of total employees in Europe (European Commission, 2013), in the ICT sector though, women represent around 33% (Eurostat, 2011) of total graduates in science and technology and around 32% of employees of the ICT sector (Eurostat, 2012).

According to the Labour Force Survey done by Eurostat in 2012, the first problem is that girls do not choose ICT-related studies, whereas the second is that they choose ICT careers to an even lesser extent. From all women in the labour market only 2% of them work in the ICT sector, compared to 3.6% of men.

Additionally, one of the most important, and worrying, phenomena is the so-called "leaky pipeline", defined as women abandoning the sector mid-career. The leaky pipeline is a known fact (Gras-Velasquez et.al, 2009; Griffiths and Moore, 2010; Hunt, 2012) common both to Europe and to the US. While 20% of women aged 30 with ICT-related degrees work in the sector, only 9% of women above 45 years of age do so. Studies (Quesenberry, Trauth and Morgan, 2006) attribute this situation largely to maternity.

Underrepresentation of women in ICT is a research area that has received attention mostly in U.S.A., UK and some European countries. This phenomenon, termed "IT gender gap", however, has not been explored in Italy, yet. Therefore, the purpose of this study is doing an "initial" research, understanding the characteristics of the IT workplace culture in Italy and investigating enablers and obstacles to an ICT career for women and the challenges in remaining in the industry.

Based on international literature on gender gap we developed a research framework and a questionnaire, aimed at identifying possible barriers to an ICT career for women in Italy, taking into consideration local specificities. Framework and questionnaire have been tested within a small sample of 100 ICT female professionals. Data analysis shows that there are some cultural/environmental factors that hinder and others that play a positive role in the career development of ICT women in this country. Nonetheless, this research must be further extended as it is subject to some limitations. In the conclusions, the shortcomings are discussed as well as the updated version of the research kit.

2   Literature background

The relation between women and ICT has been studied from a theoretical point of view since long.

Three main theoretical approaches have been used to understand and explain the IT gender gap: 1) the essentialist theory; 2) the social construction theory; and 3) the individual differences theory of gender and IT.

The essentialist theory is based on the assertion of fixed, unified, and opposed female and male natures (Trauth, 2002; Trauth et al., 2004; Wajcman, 1991). With regard to the IT gender gap research, the essentialist theory uses biological differences between men and women to explain differences in their relationship to technology.

The social construction theory tends to reflect an interpretative epistemology as a lens to investigate the IT gender gap phenomenon. In this sense, gender is broadly viewed as two separate groups of men and women who are affected by different sets of sociological influences (e.g. family, school, colleagues, social networks, etc.).

The individual differences theory of gender and IT rejects essentialism and offers refinement of various underexplored areas of the social construction theory. The theory examines the individual variations across genders as a result of both personal characteristics and environmental influences in order to understand the participation of women in the IT profession.

Under this theory, several factors have been identified as affecting women retention in the IT workforce: cultural fit, mentors, role models, expectation gaps, role ambiguity, role conflict, career satisfaction and organizational commitment (Bartol, Williamson and Langa, 2006; Riemenschneider et.al, 2006; Tapia and Kvasny, 2004). Igbaria and Greenhaus (1992) reported that organizational commitment and job satisfaction are the most direct influences on turnover intentions among IT professionals.

Another problem is that women are under-represented in managerial and decision-making positions (1) few of the women entering an ICT organisation, climb up the internal career ladder completely. This phenomenon has been labelled "glass ceiling" and it is clearly identified by women, particularly those with longer careers (63% of under 30s, 71% of 31–44s and 77% of over 45s acknowledge the barriers, according to Institute of Leadership and Management 2011). Lemons and Parzinger (2001) found that poor advancement opportunities for women in IT were due to limited gender socialization and corporate culture issues.

Eventually it is necessary to understand the characteristics of the IT workplace culture (Denison, 1996; McLean, 2003), and in particular, workplace environmental factors that hinder and support the career development of women in IT. The IT computing culture has been described as having unique characteristics: largely white, male-dominated, competitive, individualistic, and antisocial (Trauth, Quesenberry and Yeo, 2008; Lemons and Parzinger, 2001; Ahuja, et.al, 2007). This culture has the potential to exclude women and minorities if they do not conform (von Hellens, Nielsen and Trauth, 2001; Roldan, Soe and Yakura, 2004; Trauth, Quesenberry and Yeo, 2008).
Cultural expectations regarding women in the IS workforce have been found to often cause their talents to be overlooked and lead to increased level of work-family conflict (Aaltio and Huang, 2007). Such perceptions have been cited as a possible reason why women have begun to delay having children (Crump, Logan and McIlroy, 2007).

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1 worldwide, in 2010 4% of companies' CEOs in the IT & Telecom sectors are female (Corporate Gender Gap Report, 2010).

Unfortunately women are often confronted with a "chilly" or even "hostile" cultural climate in many IT work organizations (Margolis and Fisher, 2002; Roldan, Soe, and Yakura, 2004) and an occupational culture that seems to privilege male workers and their competencies, regardless of the skills possessed by women (Woodfield, 2002; Bagilhole, Powell, Barnard, and Dainty, 2007).

In synthesis, literature suggests that a career in IT for a woman is a combination of individual decisions and a broad set of environmental factors.

3   Research framework

As the focus of this research is Italy, where the IT gender gap phenomenon has not been studied in depth, we had to develop a research framework taking into account Italian specificities (cultural and social factors), which could explain the low presence of women in ICT in this country.

A quick overview of women's situation in Italy is necessary to understand the model.

In 2012 the women's employment rate is 48% (2), 12 percentage points below the EU-27 average and women represent only 4% of the board of directors, whereas the European average is 11% (European Commission, 2012).

Italy, in terms of gender equality, ranks 80 - out of 135 countries - and 126 in terms of wage gap, according to the Global Gender Gap report 2012 (World Economic Forum). This data reveals that there is a lot of work to be done at cultural and social level to overcome gender diversity in Italy. Besides, the official wage gap between men and women is 6.7% (Eurostat, 2012) and it depends on the sector and on the individual characteristics: age, presence of kids, and level of education.
Italian women spend on family duties more time than any other European woman (5h20'). The family load is heavier in Italy (74%) than elsewhere and time devoted to domestic work represents the most evident element of gender difference in the use of daily time: women dedicate to domestic work on average 4h30', while men only 1h28' (Istat, 2008).

Moreover, the Italian culture is considered to have a high masculinity degree (Hofstede, 1980) which might explain a lower propensity of women to enter and/or progress in ICT, a "man's world".

According to a study (3) carried in 5 European countries (Italy, Poland, UK, Netherlands and France) in Italy there is no substantial difference in ICT knowledge and aptitudes between male and female students. Italian female students are competent in ICT and enjoy it but they do not intend to study ICT at tertiary level or pursue ICT career paths.

Looking at these facts, maternity results as a key cause to a limited career, even if the birth rate for Italian women is very low (1.3 vs 1.8 Norway and Sweden, 1.9 France and

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2 (Istat 2013) the official data varies significantly within Italian regions
3 Women and ICT: why are girls still not attracted to ICT studies and careers? (Gras-Velasquez, Joyce and Debry, 2009)

Belgium) (World Economic Forum, 2012). The welfare regime in Italy relies largely on the family, and in particular, on women, that act as the main provider of care for children, sick and the elderly relatives. This has been labelled the *Mediterranean welfare regime* (Ferrera, 1996; Gosta Esping-Andersen, 1999).
Women suffer of the "double burden" syndrome*:* the combination of work and domestic responsibilities, which is difficult to reconcile with another barrier: the "anytime, anywhere" performance barrier typical of the ICT world.

Nevertheless, the most difficult part is the cultural prejudice: the idea that the conciliation of personal, social and affective life is something that only women have to deal with.
Based on the "World Values Survey", done between 2005 and 2008, Italy is characterized by having prejudices against the female presence in the economy and society. Social pressure does matter a lot: if there are few jobs, man has priority over woman; it is more important for a man than for a woman to go to university and to get a job soon, etc. The more these ideas are diffused, the less are women included in the job market.
The conditions for working in the ICT sector seem very unattractive to women, as the industry looks extremely harsh and competitive: long working hours, no spare time, no holidays and individualized labor relations. Work life balance is therefore a key issue here. In addition, the ICT industry experiences a rapid obsolescence of know-how: software and technology constantly change and any specialist has to keep the pace with these changes to remain in the market place.

To sum up, the topic of women in IT is a "highly complex cultural issue" (Svinth, 2006) with many faces, and it is affected by a range of subtle influences including the environmental context, gender, race, class, career decisions, work life balance issues, social networks, and organizational factors (Trauth, 2000). According to Coga and Chen (2007) women's career development is more complex (than men's), because they face a number of internal and external barriers that complicate and limit their career choices and advancement. Cultural expectations regarding women in the IS workforce have been found to often cause their talents to be overlooked and lead to increased levels of work family conflict. Families continue to be liabilities to women's career development in organizations (O'Neil, Hopkins and Bilimoria, 2008). Unfortunately, women are often confronted with a "hostile" cultural climate in many IT work organizations (Margolis and Fischer, 2002; Roldan, Soe and Yakura 2004), an occupational culture that seems to privilege male workers and their competencies, regardless of the skills possessed by women. One of the top barriers that women face is the lack of role models. Studies reveal a persistent view that women "fit" better with the softer side of IS (Kuhn, Rayman, 2007) which may limit their career opportunities. All these issues influence the career options of women working in the ICT industry (see Figure 1).

Figure 1: Internal and external barriers that affect women's career development
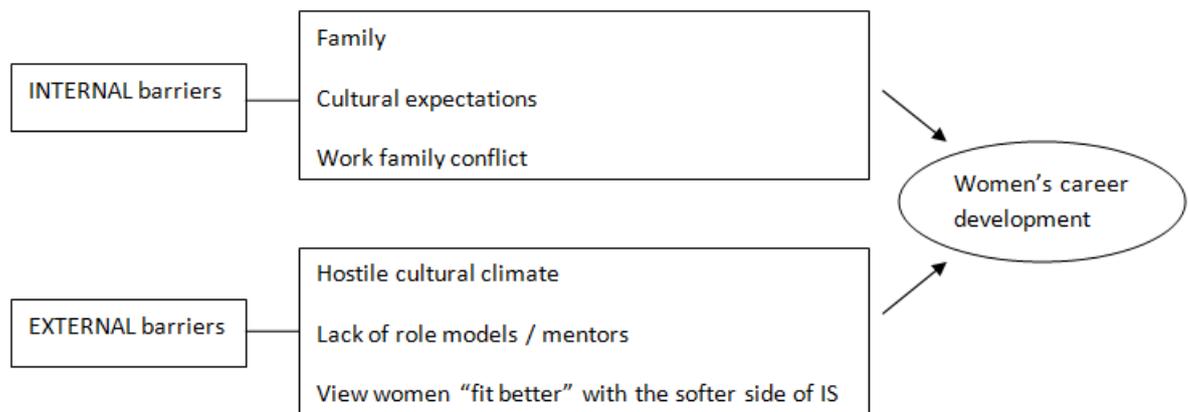
To understand the specificities of the Italian context, we have focused on the dimensions that can be strongly affected by local culture and social pressure (as seen at the beginning of this paragraph) and we propose a framework for Italy where four main factors influence the career progression in ICT (see Figure 2).

Family obligations (children or parents to take care of, house work) are a great barrier for women's career progression. Moreover, there is also the IT male dominated culture that hinders women in developing their career. We reckon that also personal choices might be a factor that influences women's career progression. Italy is characterized by having prejudices against women presence in the economy and society. Apart from the prejudices there are also many stereotypes about the IT world and women's ability to deal with it.

Figure 2: Research framework for Italy
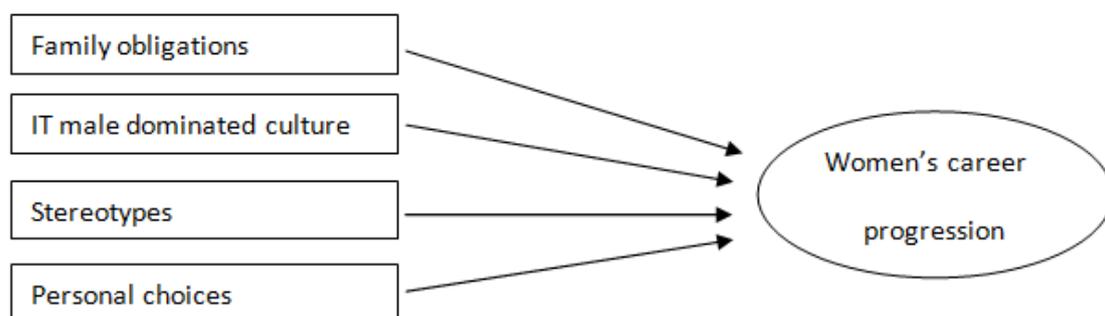
A questionnaire has been developed to test the framework. It is composed of 33 questions divided in different parts: understanding the respondent profile (educational background, work context, marital status, family obligations), self-assessment of factors promoting and inhibiting the career (agreement or disagreement in a 10 points Likert scale), analysis of their vision at the beginning of their career and now.

We decided to test the quality of the questionnaire by organising a data collection in a small sample of ICT women specialists.

The questionnaire was sent to ICT organizations, women associations, direct contacts, without aiming at any statistical relevance.

In general, the respondents were very enthusiastic about this study and asked the permission to send the questionnaire to their female friends working in other IT companies. The collection of data lasted for 3.5 months and it has reached 100 answers in total.

4   Pilot testing

As explained in the previous chapter, the empirical step aimed at testing the questionnaire. The testing sample is composed of 100 women working in the ICT industry. Data collection was done via personal contacts or word of mouth. Within the sample, we can identify a cluster of 36 respondents belonging to two big ICT organizations. The remaining 64 work in small companies dealing with the ICT industry. Out of 100 respondents, 30 work in the IT department, and the remaining 70 in departments like Marketing, Sales or Consulting. One preliminary consideration is needed: based on the composition of our sample we can identify 4 main clusters based on the company size and on the job/position of the respondent in organization (see Figure 3).

Figure 3: 4 sub clusters based on two considerations: size and technical profile
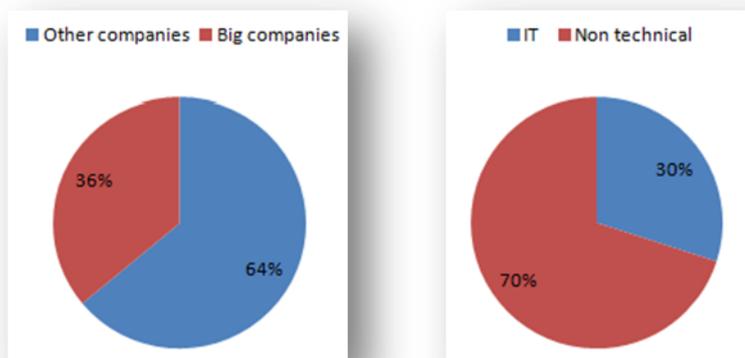
Firstly, we profile the respondents from personal data and family status.
The sample age is 37. More than half have a bachelor degree as their highest academic achievement. The pre-university educational background is technical for almost two thirds of the respondents.
In a stable relation are 66% of the respondents while the others are single. Half of the respondents have no family obligation. The remaining half has children (37%), elder

relatives (8%) and both children and elder relatives (5%). Another interesting observation is that in the "big companies" all women in the age range 25-35 have no family obligations, while in the "other companies" 40% of women in the same age range have already children or elder relatives to take care of. This is just a fact that cannot be statistically proven as a general path because the sample is very small. Nevertheless it would be interesting to study more in depth this observation and if significant to understand also the causes.

Secondly, we asked the respondents to assess the impact of enablers and obstacles on their career.

The respondents were asked to assess the impact of 24 factors on their professional career. It is a discretional assessment aimed at understanding the respondents' perception. As shown in Figure 4, four factors seem to clearly support the women's professional career: problem solving focus (5.78), teamwork oriented (5.77), challenging environment (5.71) and high accountability (5.63). Factors like - customer oriented, recognize excellence/contributions, open communication, high integrity, fast paced, employee people oriented, entrepreneurial, results driven culture and empowering - partially support the professional career of the respondents. Instead the characteristics that partially hinder the professional career of respondents are the following four: male dominated (3.31), very conservative (3.19), non consensus (3.08) and hostile/threatining (2.65).

Figure 4: Factors that support, partially support and hinder the professional career
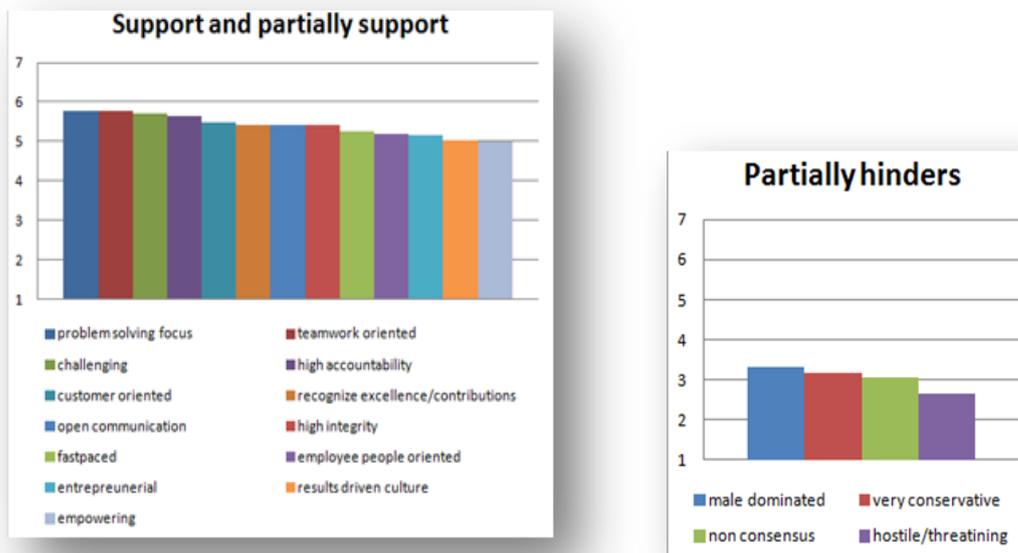
As regards the career progression, 84% of women say that they are satisfied with it. If we consider the two subclusters – IT and non technical profiles - we notice that the satisfied women in the IT field (73%) are less than in the non technical fields (89%). The reasons for being satisfied are many. The most cited one (73%) is the continuous learning of new things. The other reasons cited by half of respondents are: working with very talented people (52%), being continuosly challenged (51%) and intellectually stimulated (51%).

As regards women that are not satisfied with their career progression (16%) half of them cites as the most important reason the fact that the company did not encourage, support nor develop women for top level positions. Another reason is the fact that they are excluded from high level decision making within company. The gender discrimination is the least and not the most important reason, as we might have expected for career unsatisfaction. Only one quarter of non satisfied women reckon it.

When asked if the company, where they work, does undertake any policies to sustain women, 49% of respondents say that they do, 28% say that they do not, while 23% of respondents does not know. An interesting observation based on the cluster of IT and non IT women is that more than half (57%) of non IT women say that their company does undertake some policies while a bit less than half (47%) of IT women say that their company does not. We were expecting to see a much higher percentage for the IT cluster as the work environment in the IT domain is more hostile than in the non IT one, and companies should undertake some policies to sustain somehow women. This result might be due to the fact that women in IT are only 30 out of 100. It should be analyzed how does this percentage change when the number of IT women is equal to or higher than the number of non IT women. The most cited policies undertaken are the options for flexible working condition and location, programs that encourage female networking and role models, support programs and facilities that help reconcile work and family life.

The research framework tries to understand whether the perception about the gender issue has changed alongside the women's career.
At the beginning of their career, 53% of IT women versus 41% of non IT women thought that their gender would influence their career.
In the past, they were not concerned about the "gender" issue. Moreover they were confident that gender would not influence their career opportunities and advancement. The fact that women thought that being a woman could influence their career is positively correlated with the fact that having a successful career would be more difficult for a woman (0.29) and the fact that they were aware/ concerned and this hampered them (0.27).
Today the IT women say that having a successful career has been more difficult for them, being a woman (4.5). On the other hand, non IT women partially disagree with the fact that there's a "gender issue" in their department (3.42). This finding should not surprise us as we know that the IT environment is more hostile for women than are other departments. Nevertheless this finding should be tested in a bigger sample to be sure of the result.

In our data analysis apart from performing the descriptive statistics we have also analyzed some correlations. In particular we have searched for correlations between being satisfied with the career progression and all 24 characteristics that were assessed by our respondents as hindering or supporting their career progression. The results are the following: the work environment that is male dominated and team

work oriented has a positive correlation of 0.19 and respectively of 0.31 with women's career progression satisfaction. The male dominated work environment has more to do with IT women and the team work oriented environment has more to do with the non IT women.

If we take in consideration the two clusters based on the technical profile of the repondents, the IT and non IT women, we realize that the positive correlation with the characteristic "male dominated" exists in both clusters but is higher for the IT (0.3) than for the non IT (0.1). This finding suggests that the male dominated work environment has more to do with IT women's career progression satisfaction than with the non IT one. We did not expect that the male dominated characteristic of the work environment might be positively correlated with women's career progression satisfaction. This might suggest that the ones who replied to the questionnaire have developed some male characteristics and do enjoy the male dominated culture. Nevertheless this is just our observation that cannot be statistically proven as the sample is small and also the correlation even if positive is very small. The positive correlation with "team work oriented" characteristic is present in both clusters but with a different magnitude this time: for the IT cluster (0.12) is lower than for the non IT one (0.48). The work environment that is team work oriented has more to do with non IT women's career progression than with the IT one.

For IT women the work environment that is very competitive is highly and positively correlated (0.4) with their career progression satisfaction. This finding suggests that a very competitive work environment is a driver for the IT women's satisfaction in their career progression. We have to admit though that we lack any information about the respondents' personality. It might be that the women who chose ICT are very competitive by nature and therefore decide to make their career in this field. For non IT women instead the work environment that is employee and people oriented is positively correlated (0.28) with their career progression satisfaction. This finding suggest that the work environment that is employee and people oriented might have something in common with non IT women's satisfaction.

We have analyzed also the correlations between the fact that companies do undertake policies to sustain women and all 24 characteristics that were assessed by our respondents as hindering or supporting their career progression. The results are the following: the undertaking of policies, for all 100 respondents, is positively correlated with the following characteristics: team work oriented (0.28), male dominated (0.23), entrepreneurial (0.23), high accountability (0.2), open communication (0.2) and diversity not valued (0.19). This finding might be interpreted in the following way: the work environment that is team work oriented, male dominated, entrepreneurial, with high accountability and open communication might have something to do with the fact that the company undertakes some policies to sustain women. The negative correlations that exist are very low and therefore irrelevant.

If we take in consideration the two clusters based on technicality of the job (IT and non IT profiles), we realize that the positive correlation with the characteristic "male dominated" exists in both clusters but is much higher for the IT (0.23) than for the non

IT cluster (0.06). This might be interpreted in the following way: the work environment that is male dominated has to do with the fact that companies where IT women work undertake policies to sustain women. The positive correlation with "team work oriented" characteristic is present in both clusters but with a different magnitude this time: IT cluster (0.09) and the non IT one (0.17). This might be interpreted in the following way: the work environment that is team work oriented has to do with the fact that companies where non IT women work, undertake policies to sustain women.

Moreover we have analysed the correlations between the fact that the respondents at the beginning of their career thought that being a woman could influence their career and their vision back then. The results are the following: the fact that women thought that being a woman could influence their career is negatively correlated with the fact that they thought gender was irrelevant (-0.59), that gender would not influence their career opportunities and advancement (-0.42) and that they were not aware of any "gender issue" (-0.33). The positive correlations are instead with the fact that having a successful career would be more difficult for a woman (0.29) and the fact that they were aware/ concerned and this hampered them (0.27).
As regards the clusters based on size and those based on the technicality of the job, there are no relevant differences.

In addition we have also analyzed the correlations between the fact that the respondents at the beginning of their career thought that being a woman could influence their career and their vision today. The results are the following:
The fact that women thought that being a woman could influence their career is negatively correlated with the fact that today the gender is not influencing their career opportunities and advancement (-0.24). This statement may be interpreted in the following way: as today's belief, that gender is not influencing career opportunities, "increases" (becomes stronger), the past belief that gender could influence career, "decreases" (becomes less strong).
As regards the two clusters based on the technicality of the job (IT and non IT), the only difference from the general path is that the IT cluster is not correlated at all (0.00) with the consideration that "my gender is giving me the possibility to make a difference" while the non IT cluster (0.31) and also the whole sample (0.23) is positively correlated with this characteristic.

We have also tried to verify some answer patterns. For example it would have been interesting to see how those who are satisfied with their career progression evaluate their vision back then about the gender relevance and their today's vision. Unfortunately, the results obtained in doing the regressions were not significant at all. This was due to the small size of the sample.

5 Conclusions

The data analysis shows that there are some cultural and environmental factors that hinder (male dominated culture and the conservative, non consensus and hostile work environment) and some others that support (challenging work opportunities and employee oriented workplace culture) women's professional career.

Male dominated characteristic of the work environment is positively correlated with career progression satisfaction of women from the ICT related cluster.

Policies that companies undertake to sustain women: the percentage in the ICT related cluster is lower than in the non ICT related one.

Women have satisfying careers and enjoy the work they do. Nevertheless the satisfaction of the two clusters is correlated with opposite work environment characteristics (a very competitive work environment is positively correlated (corr=0.4) with the IT cluster while the team work oriented characteristic of the work environment is positively correlated (corr=0.48) with the non IT cluster).

In the past, the two clusters perceived the "gender issue" in the same way. They were not concerned about the "gender issue". Moreover they were confident that gender would not influence their career opportunities and advancement.

Now, the issue is perceived differently. The IT cluster is more affected by gender, as they say that having a successful career has been more difficult for them, being a woman. On the other hand, the non IT cluster disagrees with the fact that there's a "gender issue" in their department.

The results of this first effort to explore the gender issue in the ICT industry in Italy are surely interesting, but the present research presents clear limitations.

First of all the sample, as we have only 30% of the respondents working properly in the IT department. The other 70% of respondents work for ICT companies, but in departments different from the IT one. Extending the survey and focusing mainly to women working in the IT department would be helpful both statistically and in terms of contents.

Another relevant future step would be considering the intrinsic characteristics of women working in IT departments and comparing them with women in other departments of the companies. By exploring this topic, many of our not statistically strong observations will become clearer. In fact, we might understand better how the "gender issue" is perceived and how it has influenced the career path and to what extent it is linked to the personal profile of each woman involved in the survey.

Another modification suggested regards the questionnaire, where some of the questions have resulted not relevant or too detailed for the research. Additional questions exploring possible links between career satisfaction/progression and the marital status or family obligations of a woman could also help in the answers.

In synthesis, this research is just the first step to start understanding an interesting topic whose relevance is high also for the new generations and their career choices and models.

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