



Department of Political Science
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WOMEN AND ICTS: AN ANALYSIS OF SOCIAL,
CULTURAL AND ECONOMIC FACTORS RELATING TO
GENDER AND ICTS

Thesis supervisor:
Professor Emiliana De Blasio

Candidate:
Federica Cicerchia
076212

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Introduction

21st-century technological advancement is running undoubtedly fast year after year, producing serious and impactful social changes in all sectors of society. Without any doubts, people are living and experiencing what is called the “Fourth Industrial Revolution”, which is impacting on the life of millions of people. With the “Fourth Industrial Revolution” term it is meant the new 21st century wave of technological breakthroughs, characterized by the advancing of technological sectors such as artificial intelligence, robotics, Internet of Things, nanotechnology and the new digital Information Communication Technologies area, hence the acronym ICTs. Although there is no a universal definition for ICTs, the broad meaning comprises “a complex and heterogenous set of goods, applications and services used to produce, distribute processes and transform information” (Suresh,2011,p.17). ICTs segments include telecommunications, television, radio, computer hardware and software, computer services and electronic media. In this dissertation when referring to ICTs, it is meant all the new digital segments, all the infrastructures and components that enable modern computing. Digital ICTs play a big part in the current digital technology revolution. It seems plausible to affirm that this revolution carries not only the development, creation and exploitation of new technological tools, but it entails also far-reaching changes in social and economic structures of societies. The discourse on new technologies and their social impact is complex and multi-faced; several segment of the issue may be and need to be deeply studied and analyzed. Much can be said about the role of new technologies in society and the literature is endless. As the digital era advances with new kind of technologies, all the network of actors engaged change too.

In this dissertation the discourse on new digital technology serves as a background to investigate the relation between gender and ICTs, more specifically the relation between women and ICTs, both in the employment sector and in the social-cultural realm. With the advancement of new technologies and ICTs, gender roles are brought into question because of the very ‘liquid’ nature of technologies itself. The sociological soil upon it is built this dissertation is the implication that ICTs have on social structures, whether new

technologies have the power to change social structures or in the contrary case, whether it fosters the yet existing gender-structured systems of power, which ultimately is reflected in the division of labour and of sex-roles.

With this background in mind, three-sides of the relation between women and ICTs are analyzed along the study.

In the first chapter, this dissertation aims at investigate if there is a real problem of female underrepresentation in ICT field in most of Western liberal-egalitarian countries and where these problems arise. In the second chapter instead it is analyzed the relation between women and the Fourth Industrial Revolution. Since humanity is facing a new Fourth Industrial Revolution and the future of job is increasingly and steadily shifting toward ICT jobs and flexible working conditions, it is relevant to understand what will be the place of women and what role they will play in this new worldwide scenario. In order to investigate and study these topics, it is important to make full use of recent reports published by public and private international organizations, NGOs and government's guidelines and programs. Finally, the third chapter takes in consideration the socio-economic effect of ICTs on women empowerment. More specifically, the social, political and economic empowerment of women in ICT sector and through ICTs considered as tools. The purpose for this topics is that ICTs provide unique opportunities for human development, especially for women. So, it is essential to analyzed how the pattern of socio-economic empowerment of women in ICTs and through ICTs is made up.

The rationale behind this dissertation is to further analyze the relation between women and new digital technologies (which is still far from being chartered) and to discover the potential that this new field offer both to women and society. The discourse is certainly innovative and recent, but at the same time it brings with it a social and historical significance, which impact reality still today.

In June 1916 at the Massachusetts Institute of Technology, the graduate Mabel Keyes Babcock in writing the introduction of the registration committee of the MIT Women Association wrote the following words:

“The story of such pioneers in the education of women as Maria Mitchell, Alice Palmer and our own Ellen Swallow, the first women graduate in Science in 1871 (...), sounds like a tale from a far distant past. They found the education of women entrenched in prejudice and convention, but with clear vision they labored and ceaselessly and

successfully to achieve for women the abundance of opportunity which it has been our privilege to enjoy. (...) It is scarcely to believe that the way already won will ever be lost; but problems there will be, perhaps more difficult, perhaps more subtle, than the early ones, and for their solution there will more and more be needed the trained hand and mind, the will do and the intelligence to direct. May there always be Technology Women to the fore, winning a way which others will keep open”.

(Mabel Keyes Babcock, “Technology Women”, Registration Committee MIT Women’s Association, Introduction, June 1916).

It is precisely with this legacy in mind that this dissertation is based. The consciousness that much have been studied on the topic of women and technology, but at the same time much have to be done in next future to keep the “winning way open” (Babcock,1916), is there. New questions on gender and ICTs arise: what are the new links between women and the technological globalization? Do new technologies are gender neutral? What are the connections between women and ICTs? Are new technologies reproducing and sustaining the gender-structure systems of power? Does ICTs open up new employment opportunities for women in the ICT employment sector? These are complex issues to tackle. However, this dissertation aims at finding out some answers to these compelling questions.

The importance of put gender as central and not at the margins is imperative to the analysis of ICTs and society and is at the core of this dissertation. The very ultimate effort is in fact to analyzed the argument as something natural and not solely from the feminists perspective or from “the diverse” approach. Based on the assumption that this topic is far from being exhausted, it certainly could have been deepen even more. However, the relevance of this dissertation lies on its central purpose: to shed a light on such significant and valuable social phenomena, such the one of gender, women and ICTs’ relation, which is highly relevant to the understanding of the present reality and of the future development of next generations.

Chapter I

“Women, digital technologies and ICTs: a social and cultural debate”

1.1 The Google Case: a new wave of white-male racism?

On the 8th August of 2017, James Damore, a Google-engineer wrote a memo that would have remained sadly famous in history of ICTs. The 28 years-old white American man affirmed blatantly that women are not good at IT jobs as well as men on the ground of biological differences. Demore's core argument is that “Men and Women have psychological differences that are result of their underlying biology. Those differences make them differently suited to and interested in the work that is at the core to Google. Google is trying to create a technical, engineering and leadership workforce with greater number women than these differences can sustain, and it is hurting the company” (Demore's memo, 2017, cit by The guardian, 2017). Apart from Demore's blowback for biological essentialism and biological structuralism, his memo is quite shocking when confronting with Google data on its workforce composition: 69% male and just 2% African American, with just 20% of technical jobs are held by women. These data were recently released by Google after having been investigated and accused by the US Department of Labour of discrimination against women. It is just after 2014, that the top tech-firms in Silicon Valley began releasing data about their workforce and campaigning in favour of diversity programs.

This case put the ground to start considering the way ICTs impact society and all its components. It put people asking themselves why seems to be so much resistance toward female participation in IT jobs and careers, despite significant improvement in past years. But other than that, it questioned where technology's social and technical deterministic nature is going. Maybe this male reprisal toward IT new openness is the sign that something is undoubtedly, certainly slowly, changing in our society. Damore, who has been straight away fired, have spurred a online debate on the topic of free-speech right and online white-male radicalization, which may be unreal to the eye of anyone in our 21st-Century technological society. However, the problem with this story

is that it raises some urgent questions: how far from the public opinion common sense are Demore's statements? To the mind of an American 28 years-old men, why should girls be refrained from studying certain subjects and considering of applying for ICTs jobs? What is the social perception about ICTs jobs? And why does IT ground seem hostile toward gender diversity? And, are there some country- and racial-based differences that can foster this issue?

These are some among the most urgent questions that this topic sparks. The episod is so relevant and consequential for my academic research that I choose it to introduce the first main argument of this dissertation. Next paragraphs are going to give some sociological insights on the formation of gender labour-aspirations identity and some insights on ICTs Educational importance. Both of these arguments are essential to understand how the constuction of personal and social identity is fundamental to how women grow their way into the current Fourth Industrial Revolution.

1.2 Hints from Sex Role Theory and the Division of Labour: a classical debate.

Since the 1950s to the present day, much have been written on the topics of 'Sex Role Theory', 'Socialization Theory' and on 'Psychoanalytical and Gender Order'. These wide and endless arguments have been extensively treated in the past sociological and psychological literature. Far from considering these subjects approximately, it is improntant to use some of these historical subjects to build up the very argument of this chapter: to investigate the phenomena of sexual division of labour in the ICT field, from sociological reasons to educational evidence.

In the 1960s, Betty Freidan's famous masterpiece 'The Feminine Mystique' exactly reproduced the core of 'Sex Role Theory', denouncing both freudian psychological analysis about women inferiority and envyness towards men, and functional approaches which confined women to their sex biological reproductive function as households and mothers. At the end of the book, Friedan's questioned women about their fear to reinvert the social order of society and take back control of their own independence, freeing themselves from 'fixed roles' and 'sterotypes'. Friedan' piece was just the starting point for future academic effort to study and investigate the relation between gender and power in society.

The 'Role Theory', which can be tied to the sphere of sex then, is the approach to social structure which locates its basic constraints in stereotyped external expectations (Connell, 1987). And this definition can be generally applied to all the spheres of human behaviour. When sex comes into play, social structures are connected to the formation of personality, which in turn is framed by the biological dichotomy of male/female genders. Basically, this theory implies that both men's and women's behaviour react to certain social expectations (Connell, 1987). Of course, social structures and social expectations are linked to the influence of culture. Both varies dependently of what culture they are located in. (Fromm 1945). Social structures and consequently social roles may vary from one culture to another. So the so called 'socialization theory' or 'role learning' tries to explain how sex roles are formed and institutionalized. This concept was largely studied by Talcot Parsons (1956) who formulated his *Consensus Theory*, according to which this process of gender roles formation, the longlife process of learning and performing feminine or masculine tasks is carried out through four agents of socializations: Families, the School, the Peers and finally the Media. Each of these categories has a role in shaping and structuring the unconscious of people.

Of course, these theories have been subjects of criticism, especially by Connell. Sex role theory and Consensus theory seem to reduce the entire discourse on two directives: the first is volutarism; it seems that the the agent finally plays a superior role over social structures because, in the end, people choose to mantain the custums instead to subvert them. Second, in *sex role theory* by defining role theory with a sexual connotation, the biological dichotomy of sex is automatically defined (Connell, 1987). The mix between social structures and volutarism best suited the concept underlying the changing of labour and organizations. If it is true that social structures shape people, it is equally true that social structures and practices are created by people, and people can change and overt them. Yet, people can slowly change social structures and consequently their social roles by only becoming consciuois about their potential to do it. Accordingly, the last open question that Betty Friednan asked herself on the reasons by which women kept fitting in their female character can be redirected nowadays: are women more consciuois about themselves in the new IT digital era, thanks also to multilater flows of informations? Or better, how does the *sex role theory* and the *socialization theory* change

with the coming of the Fourth Industrial Revolution? Does the ITzation of society lead to de-composition, as Connell called them (1987), in the formation of social structures?

Intuitively, one can answer these question with a positive response. Anthony Giddens (2013) apparently disagrees with this point. Although he proposed his arguments in the late 1970s, in his 'duality of structure' he affirmed that structure and practice are tightly together; human practice presupposes social structures, in a way that practice calls into play social resources (Giddens and Sutton, 2013). The problem with this theory, according to Connell, was that social practice always responds to situation and certainly they are influenced by history (Connell, 1987). We act the way we do because we respond to a certain particular situation and historical events. If it is true that social structures survive over time, it is also true that the way things happen in history may change them through time.

Following these patterns, sex roles change alongside history too. In the 1950s, women had to perform certain specific gendered practices differently by those of men, which seemed to be quite different from those of recent times. When considering the rigid way labour was divided in between men and women, it is true that the latter had to take care of household work and childcare, while the former used to perform the classical 'breadwinner' role. This was the classical segregation of labours; and, time after time, this social practice of segregation of labours led also to the differentiation of skills. The assumption that women are naturally caregivers, teachers or nurses as well as endowed with emotional intelligence, while men are physically stronger and technologically smarter is a consequence of that segregation. Nowadays instead, sex roles are more blurred and women enter the workforce more freely, apparently without constraints or fears to be judged or anxiety for not performing typical sex roles.

However, the sexual division of labour and its differentiation of skills have brought on the stage reflections concerning not only the allocation of people's work, but also the way they design it (Power P, cit. by Connell, 1987). It is not just the type of job *in se*, but also the way that job is carried out. The irruption of technology in the history of humanity certainly changed and still changes the way work is carried out. From the old technologies, like print-media and fixed-lines telephones, to the Internet and the 'Google imperium', the sex division of labour slowly moves and definitely will move. This point is crucial to

introduce the next step concerning the discourse on technology and specifically on gender and the new ICTs.

1.3 The technical and the social dimensions of the New Technologies.

Mainstream views on technology often failed to value it as a technical tool, rather than something that itself had the power to be influenced and to influence society (Gurumurthy, 2006). The ‘technicist’ position is that, irrespective of the social construction of technology, “once the technology is constructed its technical capacity is inscribed or encased into its fabric such that it operate sas an independent variable” (Grint and Nixon, 2015).

Indeed, many sociologists argue that technology, *qua apparatus*, cannot explain social phenomena and events since technology is itself something constructed (Winner, 1985 cit. by Grint and Nixon, 2015). The assumption that technology is something built is at the basis of the “designer technology approach”, which in turns assumes that technology is made by individuals and that its design reflects the rationale of those individuals. In this terms, it can be assumed that technology is in part political and that its effects are still mediated by social action, structures and unintended consequences (Grint and Nixon, 2015). So, according to this view, part of the social aspect of technology relies on its design process, but most of all *on who* drives this process. To the other side, there is the position occupied by those scholars who believe in a prevalent “social dimension” of technology. In this view, the evolution of new technologies and of new ways of communication has lead to several changes in society and in social structures as well. Technology lead to differential influences on the various sections of society, so following the social dimension position, technology is not gender neutral because is socially constructed (Gurumurthy, 2004). Along with this view, there is the coexistence of theories realted to actor networks model, wich suggests that “actor networks involve both human and nonhuman actors and we should not distinguish between human and non-human elements but should talk instead of the heterogeneous entities that constitue a network”(Bijerk et al.,1987 p.11 cit.by Grint and Nixon, 2015). Following this model, human and non-human actors are contingent and require constant reproduction of

networks of power by the actors involved (Grint and Nixon, 2015). What emerges from these different theories is that they mutually influence each other, with the result that one merges with another one, creating multiple points of view.

In the debate between gender and technologies it is important to stress that the multiplicity of the point of view and of women's identities make impossible to over-generalize and analyze the relation under a single prospectus. However, it must be added that many academic researches on this topic found out that ultimately new technologies are not gender neutral and that social structures of gender inequalities tend to replicate due to and in the virtual space of digital realms.

Accordingly, since new technologies and the Internet can be considered both as frameworks in which social structures perpetrate, and, at the same time, as non-human entities able to slowly change some of those social structures, it is important to assess what place find women in the new ICT arena.

1.4 Gender and the new ICTs: It's still a man's world.

ICTs have brought significant employment gains in the last years, including women employment (Gurumurthy, 2004). However, since technologies have also a social dimensions, their changes brought in the employment sector have also some dramatic consequences.

A part from the well-documented problems related to gender digital access divide, (which, although narrowing year after year, per se constitutes a structural barrier to the access of women to the new ICTs, the gender *social* digital divide is much more alarming, especially for its side-effects. The main reason relies on the actors who drive and control the process of technologies design. Most of these actors are members of powerful corporations and nations not affected by issues of racism, sexism and equality.

“Existing power relations in society determines the enjoyment of benefits from ICTs” (Gurumurthy, 2004 p.1). It is clear that patterns of gender and racial segregation are being reproduced in the ICTs sector, although the giants of the sector are starting campaigning in favour of the sensibilization on gender and ICTs (see for instance Google, IBM, Microsoft, Intel). However, problems still occur: at a general level, women still have

little confidence in this sector and are underrepresented at the higher decision-making level positions in private sectors, government and private parties which control this area.

To sum up this point, ICTs are not gender neutral and, still in the 2017, gendered power relations greatly affect gender inequalities in the ICTs stage (Hufkin and Huyer, 2008). The result is that, at a macro level, women will continue to have fewer opportunities to benefit from the myriad possibilities of the Digital Information Age. Particularly, in terms of job and business opportunities. To give a quantitative account for this phenomenon, overall the majority of jobs for ICT specialists are held by men. The gender gap starts at school: according to the World Economic Forum's Global Gender Gap of 2016, the GGG stands at 47%, with 30% of all male students graduating from STEM (Science, Technology, Engineering, Mathematics) subjects, compared to 16% of all female students. Moreover, the 2016 Eurostat's data show that "the proportion of women working in this segment of the labour market in the EU-28 has declined since 2005, to 16 % in 2015 vis-à-vis 84% of men" (Eurostat, 2016). In UK, data show that women only make-up 15 % of ICT professional (Eurostat, 2016). Globally, diversity data published by major global technology companies found that around 1 out of 4 technology and leadership roles are undertaken by women (Coralescence study, Lighter R. & Molla R. Diversity in Tech Company, the Wall Street journal December 2014). These are just some quantitative examples that illustrate the problem. The latter's data analysis is going to be deepened in the next chapter.

One of the problems of researching these topics is that social practices deriving from the use of ICTs and the internet are slowly changing and it is difficult, at the this moment in history, to fully grasp this change. New websites and women ICTs private organization are more and more emerging and gaining social power and visibility. Accordingly, it is clear that there is an increase in social awareness on these themes. From one side, the ICTs and the way Internet is reshaping social existent structures and gender roles, promoting the universal principle of equality, is an example of how the objects of structures are changing the structures itself. From the other one, the ICTs can also be important tools for promoting gender equality and empowering women through the increasing knowledge of rights, self-esteem, confidence and social status. But most of all it can contribute to new employment possibilities and better income (Hufkin and Huyer, 2008).

Notwithstanding this argument, the gender digital divide gap exists and it is important to keep investigating on this topic and assessing why there is so much resistance in government sector, private multinational parties, but also from the individual point of view to address these issues. Some urgent questions emerge at this point:

what are the factors that hinder women to take on ICTs careers? How do women see themselves in ICTs sector?

The next paragraph aims at getting to the heart of the matters, trying to answer these questions.

1.5 Factors and barriers that affect girls and women's participation in ITCs and computing backgrounds: structural and social factors.

In the 2000s, a conspicuous number of studies and inquiries sought to tackle the problems related to lower women's participation in the ICTs. Most of them tried to detect the factors that were at the basis of this phenomenon; almost all of these researches discovered that there are certain clear elements and patterns that affect it. 15 years apart researches show that those factors haven't changed at all, although generally the job market and recruitment channels have put the emphasis on the importance of ICTs job positions as drivers of future development change and economic growth. Yet, it might be useful to point out that in some countries worldwide (i.e. South Korea) the gender gap is only 7% and that in the US some targeted policies showed as results some positive trends of shift. Change is underway, but much more needs to be done to improve the way. As Aspray and Cohoon (2008) pointed out in their extensive studies on women and underrepresentation in ITCs, the reasons for the lack of participation and, in some cases, decline in women technological engagement are several and severe. Undoubtedly, there is not biological explanation for the phenomenon. On the contrary, "the causes are so complex and deep-seated in our institutions that society is not willing to make the changes that would produce gender equity" (Aspray and Cohoon, 2008 , Intro).

1.5.1 Structural factors: the importance of education and the role of teachers, peers and parents.

Education is at the core of the ITCs gender gap. Researches show that the ICTs and STEM gender gap start in the youthhood. Of course, this topic is wide and diversified; several educational factors influence girls' participation in the ITCs. From the importance of targeted programs in school to the role of teachers, parents and peers; from the influence the media to the way girls perceive themselves in a technological setting, these are all factors have huge effects on the low attendance, interest and empathy of girls in this sector. Since the early childhood, the way childrens interact with technology and computers is fundamental to their future positive or negative relation with it. ICTs educational policies should be directed not only to the teaching of Informatics, but especially to a *creative and active* process of thinking technology. Computers are not just tools but interactive incubators of creativity. In some developed countries, like the USA and the UK, evidences claim school boys take up more optional classes in STEM and computing than girls. Many studies from the early 1990s till today affirm that what is taught at school and how it is taught influence students' beliefs about what type knowledge is important and what is interesting (Aspray and Cohoon, 2008). Accordingly, at the basis of this last affirmation there is the importance of the design of school curricula, optional classes and laboratories.

Worldwide, the trend shows a felt need of incorporating diversified subjects of technology in school curricula. In the United States in almost all public schools computer science courses do not exist, are elective, or are part of extracurricular activities (Aspray and Cohoon,2008). If a subject is missing in formal settings, the result for the particular knowledge area is to be overlooked by the majority of students (Aspray and Cohoon,2008). How can students grasp and understand the opportunities of ICTs in the job market if they consider it as an optional, extacurricular activity? A positive element is that there is an increased number of countries which are intruding the use of computes in schools. In recent years, the European Commission adopted different policies to open up education through technology. These policies are essential to meet the socio-economic demand of labour market which are more and more relying on digital skills and competences. European data in fact shows that barely a 37% of people in the EU have digital skilss, and that between 50% and 80% of children never use digital pedagogical

tools in classrooms (European Commission, Eurostat, 2015). It is well recognized that investing in digital skills will translate into better individual and macro socio-economic outcomes. To this purpose, the EU Commission is guiding national education ministries to develop a digital culture in schools, targeting both teachers and pupils. In Italy for example, since 2012 the Ministry of Education has adopted specific guidelines about the schooling of technology in classrooms. In one report, it is specifically written about the importance of children using technology neither as tool nor as a toy, but as a resource to expand their creativity and to positively interact with the world. Interacting with the latest technologies is seen as fundamental in kids' development of a new sense of environmental and civil responsibility and engagement.

A qualitative research carried out in the UK in 2015 called 'Women in Technology Project' expands these topics. It has been seen that early engagement (at nursery and primary school) with technology is a critical factor to increasing the number of girls entering technology as a course career. On the other side, if girls are not well informed in their schools about the hypothetical range of careers in science and technology, the odds they will undergo a tech career are incredibly high. Institutions and schools have to stimulate girls' interests in the ICTs, even through exposure to female role models. Surveys conducted by the TeenTech indicates that one of the biggest barriers to girls' entrance into tech careers is the lack of female role models. Accordingly, the roles of teachers and parents are absolutely crucial to girls' future choices. Not only teachers have to be trained for general computer use, but they are also suggested to endure a pro-active attitude towards technology. As Aspray and Cohoon pointed out, "teachers' beliefs and attitudes about appropriate behaviours and roles for boys and girls, combined with their attitude and beliefs about technology, can subtly influence girls not to study computers" (Aspray and Cohoon, 2008, p.20). Families play an important role too. One of the most important study concerning the relation between parents and their influence on children's attitude towards technology was undertaken by Margolis and Fisher in 2002. They carried out on a sample of undergraduated computer sciences majors at Carnegie Mellon University and revealed some interesting results. Among the latter it was evident that usually parents have a great influence on kids' choices, especially fathers being 'the influencer' on attitudes towards computers and technology. In 'Unlocking the clubhouse' (2002), Margolis, quoting Goldenstein (1994), states that fathers usually play introducing

computers and videogames in their bedroom earlier with their sons than with their daughters. Girls are encouraged to take computer classrooms but later in developmental stages, usually during high school. What about the role of mothers? The 2005 Adya's and Kaiser's study shows that mothers will play a positive role model in future generations. While the social influence of fathers and peers will remain stable over time, the impact of more women in the workforce and leadership positions in male-dominated fields will benefit future girls' career choices (Adya and Kaiser, 2005).

There are unvoluntary differences in the way parents apply their desire for education on children, and this is also connected with socio-demographic and socio-economic variables affect future college and career aspirations of children. Generally, families as institutions form their own ways of behaving and playing in their structured beliefs system. Forming their own ways of beliefs, they inevitably affect the intensity and nature of their children's ITs use and, consequentially, their academic performance (Jackson et al., 2008).

Cultural beliefs and attitudes toward ICTs is also at the basis of children's stereotypization of roles and ultimately of girls' confidence in university career choices.

1.5.2 Social factors: cultural beliefs, social stereotypes and self-confidence.

It is not just a problem of school curriculum, teachers and families' influence. Still there are some cultural, social and individual factors that lag behind girls' attitudes towards the ICTs. Cultural images concerning the female-male dichotomy still exist nowadays. It seems that liberal-egalitarian models about gender equality did little to overcome gender-essentialist view on the ICTs roles (Aspray and Cohoon, 2008). Sex-segregation in these studies still persists and there is still the perception that "girls are good at some things, and boys at other ones" (Aspray and Cohoon, 2008 p.29). This is especially true for peers' and media influences. Of course, it is difficult to empirically study and test whether culture, stereotypes and images influence women's representation in the ICTs and computing careers. Notwithstanding all this, cultural beliefs about gender differences in self-assessment, which in turn affect aspirations, are hard to reinvert. Social desirability translates into stereotyped roles in society. Stereotypes are products of social structures and influences. Social structures produce ideologies and preconceptions that work like lenses and filters. What people usually see is the product of

lenses, which most of the time is narrow. (Lee and Gilovich, 2015). Students' selection of education and careers within the computing discipline also provides evidence of shaping role of culture (Lee and Gilovich, 2015, p.149). These social influences have the power to impact internal and external influences (Lee and Gilovich, 2015). The classical stereotype between teens is that boys are more likely to be nerd or geeky, to be rational and logical, while the girls are likely to prove themselves irrational, open-hearted and care-giving. These are kinds of social stereotypes that affect teens' identity and social roles and, consequently, their careers choices. There are few studies about children's perception as computer users, but there is a slight evidence that the ICTs careers are felt like male career choices, usually producing what is called by Margolis "boysclubhouse" (2002) of technological and computing education. The phenomenon intensifies even more when all role models like parents, teachers or peers replicate these stereotyped roles, producing a knock-on effect.

Although there are empirical signs by online community that this gendered trend is changing (see for instance GirlsGeek.org, GirlsinTech.it, TheGirlswhocode.us, techbirdgegirls.org, TechGirlsin Dharavi.in), yet there is still a social stereotypization on male-female roles in society, the so called 'gender essentialism' in the ICTs. The result is that girls usually grow up with a gendered view of computing and that has important consequences in terms of interests, confidences and course-taking. Overall, gender stereotypes influence self-expectations and interpretations of experiences, which in turn results in lack of confidence in the ICTs.

To investigate the attitudes and levels of confidence of girls in the IT, in 2002-2003 Aspray and Cohoon conducted a qualitative research experiment on a sample of ethnic-different ICTs undergraduate students in five US universities. The purpose was to test whether girls lack of aptitude, *habitus*¹(Bourdieu,1977,p.72 cit.by Margolis, 2002) and whether cultural stereotypes and perceptions affect girls' participation in ICTs courses and their future career-choices. 80% of girls felt quite confident that they were good as anyone else in class. 41% of male respondents found that an ICTs career is not attractive to women because it is 'unfeminine', and 68% of girls thought that an ICTs career would be challenging and attractive. Generally, several female respondents held that they

¹ Bourdieu's concept of habitus: 'the structures constitutive of a particular type of environment produce habitus, durable dispositions, predisposed to function as structured structures' (1977,72).

would like to have more knowledge support by their professors, mentors, faculty members, or a curriculum that is more sensitive to their needs. Overall, this study is interesting because it shows that girls who decide to pursue an ICTs degree are confident about themselves and their skills, but at the same time they perceive that their social environment is not prepared to completely accept their presence in the field. Of course, the respondents of this research were computer science students, so maybe girls have a different level of self-perception and self-confidence in the field than their peers' mean. However, this study confirms that gender differences among students persist; the way the gendered environment is structured still has an impact on everyday life. An interesting socio-psychological study conducted by Kelan in 2008 tested how the gendering of emotional and social skills shifts depending to different discursive context, especially in ICT working environment. Results showed that a gender dynamic in skills attribution is still incorporated into the rationale employed to make up ICT work. Even if ICT work discourse seems to offer an egalitarian place for men and women, in reality this is not the case. So, in ICT workplace the sex-role theory appears to manifest itself.

So, gendered perceptions and interactions continue to exist; objective factors like schools curricula, motivation by teachers, but especially subjective factors of these objective factors have an influence of lifespan's actions and personal choices. (Aspray and Cohoon, 2008). Researches on girls underrepresentation in ICTs and computing programs underline the importance of social and structural factors as determinants in female future careers choices and in subjective perceptions of a gendered environment. These arguments are strongly linked to the previous sociological analysis about sex-segregation of labour and roles stereotypization.

This analysis introduces the topic of the next chapter, which can be seen as the core of this dissertation: it is quite evident that processes of differentiation of skills and training by sex that develop in an early stage of life decisions lead inevitably to pattern of inequality in the labor force. Skilling and training is one of the mechanisms by which the sexual division of labour is made a powerful system of social constraints (Giddens and Sutton, 2013). Hence, in a job market more and more relying on new technologies, increasing skilling and training opportunities in ICTs is necessary to increase the chances of highly profitable careers and life opportunities for women and to break the cycle of 'sex-segregation' of labour. However, that is not all. It is not just a matter of offering

women more training in ICTs, it is a matter of actively participating in the process of invention, production and decision-making in the field of new technologies. These very last themes will be analyzed in the third chapter of this dissertation, where I will dig into the concept of empowering women in and through ICTs.

Before it is necessary to understand in depth the connection between the future of jobs in the Fourth Industrial Revolution, how it is changing over time due to the increase role and importance of ICTs and what are the employment implications for women.

The next chapter is going to explore in depth the connection between the future of jobs, how it is changing over time, and what places will hold women.

Chapter II

“Women, ICTs and the future of jobs: women’s role in the Fourth Industrial Revolution”

The second chapter of this dissertation explores extensively one of the research questions that were posed in the introduction, namely how will be the future of jobs in the digital Fourth industrial Revolution (World Economic Forum Report, 2016) and what will be the potential employment implications for women. As it was mentioned in the introduction, the ICTs, given their capacity to transfer and apply knowledge and information in every aspect of people’s lives, are considered at the core of the new-global knowledge-based economy (Huyer and Sikoska, 2003). Since the continuous and sustained development of ICTs is creating new opportunities in the economic, political and social spheres of everyday life, it is important to analyze how new opportunities benefit women, especially in the employment sector where the very nature of ICTs is to reshape, re-organize and restructure working methods” (Huyer and Sikosa, 2003, Introduction).

Much of the data analyzed have been gleaned from the World Economic Forum Report of 2016; the lack of other sources on the topic doesn’t derive from a gross structural negligence, rather it exemplifies that the subject is new and the availability of data on the future of workforce and gender relations is not extended.

2.1 The future of jobs is changing: the workforce in the Fourth Industrial Revolution.

The literature about the sociology of work has known an increased boost of theories after the Post-fordist era was converted into the so-called “Knowledge Economy and Service Sector” age (Grint and Nixon, 2015). “Knowledge Economy” is a term born after the end of the twentieth century to identify an economy where ideas, information and forms of knowledge underpin innovation and socio-economic growth. (Giddens and Sutton, 2013). Characteristics of this period is that the division between high-skills jobs

and low-skills jobs increases over time, with a significant polarization of the job market (Grint and Nixon, 2015). In fact, in developed countries the hyper-specialization of jobs requires high-levels of qualifications and computer-based competencies, while at the same time, low-skilled and -paid jobs are disappearing or replaced by computers, robots or off-shored areas of the global arena. This workforce polarization process is running faster due to the speed at which new technologies evolve (Castells, 2000). People are currently assisting to the 'automization' of jobs, a more complex and wide process than ever in history, which take place with the 'Fourth Industrial Revolution'. Castells (2000) argues that this process of automization of workforce will have a huge impact over low-skilled jobs, with the effect that high-skills occupations are growing more and more.

Certainly, technological changes bring together socio-economic and demographic changes as well. It is not yet clear where the socio-economic effects of this revolution will lead in future, but to the front of the future of jobs and workforce, there are some plausible scenarios on the horizon. Indeed, new ICTs influence the processes of economic globalisation, which equally impact men and women around the world, enabling new forms of jobs, work organization and, generally, a new division of labour (Gurumurthy, 2004).

It is quite evident that some jobs are threatened by robots and others will be or will go through a change in the skills required to carry them on (World Economic forum Report, 2016). Of course, the degree by which jobs will change varies from country to country, dependently on geographical regions; also, it will vary dependently to job sector and industry. Clearly, some sectors will experience more dislocation of jobs instead of others. Yet overall, in all sectors of industry the emergency of "portfolio workers" (Giddens and Sutton, 2013) the capacity to apply several skills and to migrate from one field to another is one of the characteristics of future jobs. The tendency towards "portfolio work" is especially common in ICTs jobs. In ICTs portfolio jobs, flexibility and multiply-skills are certainly contingent to the way job is carried out. Increased flexibility may have some important effects too (Grint and Nixon, 2015). Some scholars argued that past investments in ICTs lead progressively to worldwide decreases in employment and a shiftwards of lifestyle. Looking at the macro-level data collected by the 2016 International Labour Organization Report, unemployment is frantically growing, despite positive global economic signs of recovery. Nevertheless, any factor linked to the role of

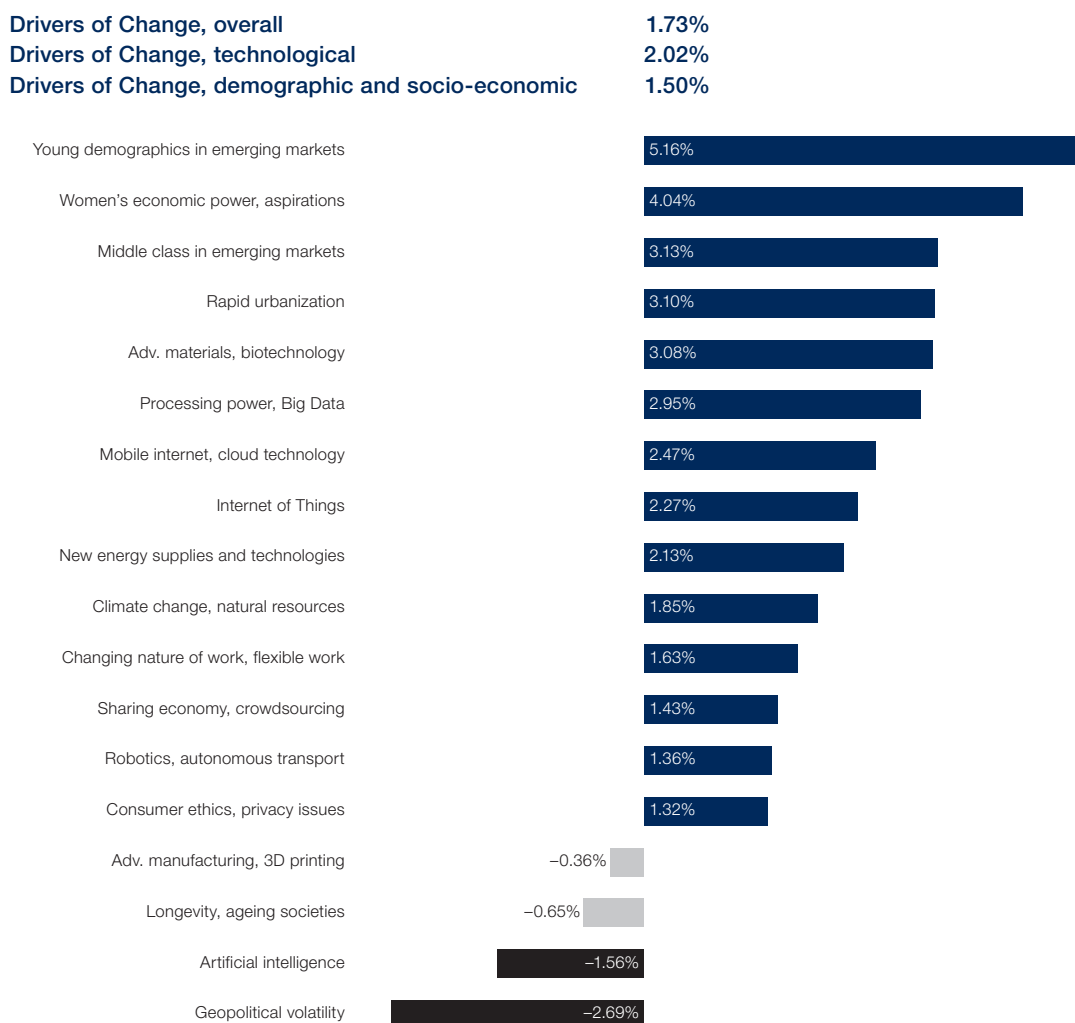
new digital technologies is considered to be a direct cause of general unemployment trends. According to the report, factors that can explain the global economic slowdown are the decline of long-term capital investment, the uneven distribution of gaining from growth, the slowdown in working-age population and the weak total factor productivity (ILO Report, 2016). There is a general reference to the fact that new waves of technological advancement have not yet materialized, but future trends demonstrate that it surely will. The contradiction and uncertainty in data show that the effects of the Fourth Industrial Revolution are still too complex to be studied and its consequences are too 'fresh'. There is also a prominent polarization of opinions to this point. Discussions about the employment impact of disruptive change are in contrast. On one hand, there appear to be those who foresee positive impacts of new technologies and new emerging job categories, which ultimately would lead people to get free from routine work (Acemoglu and Autor, 2011). On the other hand, there exist those that foresee negative outcomes like massive labour substitution and job displacement. For example, studies conducted by Autor and Dorn in 2013 showed that technology is the main factor of the polarization of European labor markets: studies that examine these alternative explanations typically find that offshoring tends to play a much smaller role as an explanatory factor when pitted against technology. At a regional level in fact, in a 2016 report concerning the future of work, the European Commission denounced that for employed people "work experience has been shifting in directions consistent with the spread of so-called gig economy" (2017 EU Commission Report on equality between women and men in the EU p.11); great polarization, non-standard forms of work like 'zero-hours contracts' and more short-term engagements are key characteristics of the gig economy according to the report. For women non-standard forms of work are more common among employees: temporary contracts account for 14.1% of female employees and 12.9% of male employees. The EU Report (2016) clearly highlighted that the model of 'gig workers' seems to have more negative effects on women than the ones regular patterns of work have, although there are quite evident benefits from the point of view of self-employment and entrepreneurship. Despite some negative consequences of gig work emphasized by the European Commission, the 2016 World Economic Report instead insists that there are some positive outcomes in general and for women too. Changes in the workforce and job market are real and are happening. According to a

significant proportion of WEF research's respondents (mainly CEOs, HR managers, senior talent and executive managers of multinational and global companies²), technological disruption is seen as a very significant driver of industrial future change. A conspicuous number of industry observers, precisely 44% of respondents, rated as the main driver of change the impact of changing work environments and flexible working arrangements as a consequence of the Fourth Industrial Revolution. At the same time, the respondents rated mobile internet and cloud technology, big Data and computing, crowdsourcing, the sharing economy and peer-to-peer platforms, AI and robotics, machine learning and 3D printing, genetics and biotechnology as top-trend drivers of change in the future years (WEF report, 2016). The following graph provides some interesting findings about employment effects of drivers of change.

Figure 1. Source: World Economic Forum Report, 2016, p.11

² 2016 World Economic Forum survey conducted across 9 broad industry sectors in 15 major developed and emerging economies and regional economic areas.

Figure 4: Employment effect of drivers of change, all job types
Compound growth rate, 2015-2020, %⁷



Source: Future of Jobs Survey, World Economic Forum.
Note: Names of drivers have been abbreviated to ensure legibility.

As the graph shows the biggest expected drivers of employment creation are demographic and socio-economic factors in nature. The most important outcomes are the increased role of the young, especially in developing countries, and women, thanks to their rising economic power and aspirations. Of course, these are just aggregated data, they do not grasp completely all the multifaced factors of employment change. For instance, they do not look at individual job families or employment sector. Looking at the data on employment sectors by job family, the better employment outlook is given by Computer and Mathematical sector, followed by Architecture and Engineering, Management, Business and Financial Operators; at the bottom of the ranking, the sectors which perform poorly are Construction and Extraction, Arts, Design, Entertainment,

Manufacturing and Production and finally Office and Administration. The biggest employment decline of any job family is expected in Office and Administrative roles, due to the disruptive effect of technology which will make them redundant (WEF, 2016 p.12). All of these changes in employment sectors will surely have great impact on job losses. Generally, data found that the burden of expected job losses will equally affect both women and men (48% of the expected net job losses on women, 52% on men) (WEF Report,2016, p.13). Yet it is clear that in the very next future it will be essential to gain the most benefits and opportunities from the main emerging industrial sectors, principally the one of ICTs.

However, the role of women has without any doubts a far greater importance than the one of men in the Fourth Industrial Revolution. As it was mentioned before, not only women are indicated as the second drivers of change in the future of employment, but at the same time, year after year they represent an increased number of new workforce. As several studies proved so far, the relationship between women and the new ICT economy is complex and sometimes contradictory. For instance, if it true that the emergence of new flexible, remote, outsourcing and on-demand working patterns and other new opportunities of jobs could result in a more gendered balanced workplace, on the other side there is also the possibility that this new trends will sustain or worsen other gendered inequalities. Questions on the new division of labour in the 'gig economy' or how will ICTs benefit women in the employment sector are constantly evolving. In this regard, researches are yet insufficient and partly lacking. Certainly, women are ever more acquiring space on the stage of global organizations, NGOs and governments who care about the future of the global economy. The next section explores the relationship between women and the newdigital global economy, trying to grasp in what direction this relationship is moving.

2.2 Women in New Technology Jobs: what the current trends and future holds

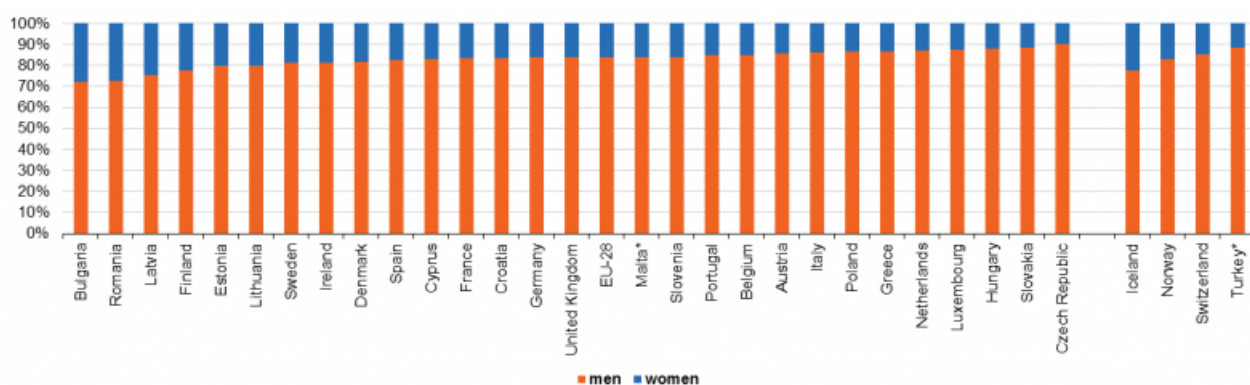
Pande and Weide (2012) claimed that the future economy will lead to changes in the traditional role patterns. The trend of global economy, ICTs and women's lives are uncertain and competitive and are full of structural problems but also new opportunities that are contributing to the empowerment of women (Pande and Wide,2012). As mentioned before, some effects of the Fourth Industrial Revolution may potentially

advantage women, through new kind of flexible jobs and development of mixed, non-structured professional roles. ICTs may have an overall positive impact on women's work-life balance, and job opportunities. For instance, maximum flexibility may be an asset; flexible locations, flexible hours through 'smart working' and self-employment are certainly positive benefits for women. However, extreme flexibility may also result in part-time, low-paid jobs with the effect of worsening the working conditions of women (Melhem and Tandon, 2009). Moreover, also the increased global supply chain competition may hurt women, in so far their ability to negotiate is often underestimated. More competition and more decentralisation of processes of supply require a higher level of credibility and financial resources (Melhem and Tandon, 2009). To what concern employment sector instead the declining of some employment sector (due to automation) held for the major part by women, like Office and Administrative, Manufacturing and Production, will negatively affect women of all ages (WEF, 2016). Overall, there are certain positive employment conditions for women, but they should not end up in low-paid, insecure job. On the contrary, acquiring new tasks on the top-level of industry in terms of upgrading their skills, particularly the ICTs ones, through a continuous long-term process might be considered a desirable outcome (Mitter and Rowbotham, cit. by Melhem and Tandon, 2009). Otherwise, as the 2005 International Organization report on Work in the New Economy pointed out, the danger might be that "patterns of gender segregation are being reproduced in the information economy where men hold the majority of high-skilled, high value-added jobs, whereas women are concentrated in the low skilled, lower value-added jobs. As traditional manufacturing industries are disappearing, (World Economic Forum, 2016) the women findings jobs in the new, often ICT-related industries are rarely the same ones as those who lost their jobs in the traditional sectors" (International Labour Organization Report, 2013). That is also the view adopted by the World Economic Forum report on the 'Future of Jobs' (2016). Reskilling and upskilling of workers, especially women in ICTs, is crucial to tackle future displacement of jobs and to get most benefits of new job opportunities.

Looking at the most recent data, there appears a long way for women to increase their participation and their voice in the ICTs employment sector. To what concern STEM and ICTs in fact, the gender economic and employment gap still exist nowadays. A report conducted in 2016 by Deloitte Global found out that gender imbalance in the ICTs is a

urgent issue since 2005, but still by end-2016 improvements are slow and scarce. According to the data gained by the company, only 25% of the ICTs jobs in developed countries are held by women, precisely 24% in US, 22% in Sweden and Canada and only 18% in UK (Deloitte's Report, 2016). Moreover data show that from 2014 to 2016, there was an overall drop of the ratio of female IT workers. However, it must be added that the percentage of women in IT varies significantly by specialization and by companies. For example, most of Silicon Valley companies may have greatly increased the numbers of their female employees; yet, it does not mean that across all US states or developed countries the percentage has improved at the same pace.

In the European picture, data are not encouraging. Although during the last decade employment in the ICTs sectors has resisted the effects of the global economic crisis and remaining an upward path (3% over the ten-year period 2006-2015, eight times higher than the average growth rate for total employment sectors in the same period) (Eurostat, 2015), that was not the case for female employment in the sector. The following picture provides a great example of how the trend in Europe is common to all 28 countries.



(*) 2006 data is used instead of 2005

Figure 2 Retrieved from: Eurostat, ICTs specialist by gender, 2015.

As the graph shows, overall the ICTs specialists are men. Accordingly, how can women can face current and future unemployment trends and job displacements if they do not fully benefit from new technologies opportunities?

At this point, it is clear that a systemic change is needed in the way the classical economic, organizational and social structures are reproduced. Women can no longer

afford to be cut off from a large, fast-growing employment sector like the tech one. First of all, it is a matter of giving space and voice to women, especially on the stages of international tech arenas. For instance, since 2003, the year of the implementation of the first World Summit on the Information Society Forum organized by the International Communication Society (ITU), to 2017, the digital agenda gradually focused on the implementation of gendered intervention. At the 2017 WSIS Forum, there has been an increase of 38% of female participants and the meetings on the global digital gender gap have been extended. At the last meeting what emerged was that since the 90% (World Summit on Information society Report, 2017) of new jobs will be in areas that are either related to digital technologies or involve the use of digital technologies the problem of filling the skills gap of women in this sector is more pressing than ever. So, once again, the importance of bridging the skill-gap and training of girls and women in the use of digital technologies is a fundamental starting point to expand their opportunities in ICT.

2.3 The ICT industry Gender Gap: the importance of targeting women.

At this historic moment all the most influential stakeholders of the world are tackling the problem of the gender digital divide and, more specifically, of the ICT industry gender gap. As it was pointed out previously, as industries prepare to face the disruptive change of new technologies and globalization patterns, the importance of the industry gender gap is at the core of the future global solutions (WEF, 2015). An increase in the perception of the importance of fairness and equality for gender parity is widespread and significantly felt among all industry sectors. Enhancing decision-making processes, expanding the talent-pool, increasing external pressure are all significant rationales for gender parity in the ICTs sector. Moreover, some current barriers have been identified too. First of all, unconscious biases among managers and recruiters who tend to promote men instead of women. This barrier is strongly linked to the discourse around cultural beliefs, sex-segregation role theory and the way workplace structures are organized, still attached to a 'male-rationale'. This point is interesting because, as the new form of labor requires more multi-skilled resources and abilities, the way the majority of companies are

organized today are still affected by the assumption that quantity, instead of quality of work is needed. This old-rationale will be outclassed in the future of work, where talent diversity, flexible working arrangements, life-long learning, multi-skilled ability, cross-industry and private-public collaboration are considered key features (WEF, 2016). Other significant barriers are: lack of work-life balance, lack of role models, lack of qualified incoming talent and leadership for women, societal pressures and women's confidence and aspirations. All of these barriers seem to be highly connected with the problematic themes in the first chapter. The need to rethink the education system at all levels is considered to be a urgent issue to address due to technological trends of the Fourth Industrial Revolution.

2.3.1 Economic benefits of narrowing the ICT gender employment gap.

Conversely, the reasons to support industry gender parity go even more far. Generally, more women in the ICTs will lead to a positive impact on countries' macroeconomic growth and economic stability. For instance, a research conducted in the 2015 by the European Commission demonstrated that if the percentage of women in the ICTs sector was equal to that of men, the European GNP would increase by approximately 9 billions of euros yearly (European Institute for Gender Equality Report, 2016). To this end, a research conducted by the European Institute for Gender Equality on the economic benefits of gender equality explicitly found that if women had more equal opportunities in STEM education and, consequently, in the ICTs employment sector, there would be a growth of the European employment rate of 0.5-0.8 % by the end of 2030 and of 2.1-3.5 % by 2050 (European Institute for Gender Equality Report, 2016). The result is that there will be an increase of GDP by 2% by 2030, which indicates a positive macroeconomic trend (European Institute for Gender Equality, 2016). It is clear how decreasing the IT gender industry gap will translate in a positive economic boost for the European Union. Looking at worldwide data instead, the picture shows the same economic trend as the European one. According to a 2016 McKinsey Report, increasing the industry gender gap, also in the ICTs sector, could add 12 trillion of dollars to GNP globally in 2025. These are just macroeconomic projections, but they demonstrate how the economic participation of women is critical for long-term

prosperity. Of course, there is a difference between OECD countries and non-OECD countries in terms of macroeconomic indicators due to the shift of the ICTs sector jobs from OECD countries to non-OECD countries because of the rapid growth of ICTs markets in emerging economies (Powell, 2016). These differences will be better analyzed in the next chapter.

On the front of industries and businesses, employing and promoting more women is a way to promote new, easy kinds of business and organizational models, new points of view in a shifting, more-demanding flexible economy. For instance, improving the level of women in ICTs may reduce the costs and risks of offshoring. Since the ICTs suffer from a severe shortage of skilled-workers, industry's response usually has been to rely on offshoring. Instead, promoting more ICTs education programs on women will benefit the industries employers and employees (Aspray and Cohoon, 2008). Moreover, increasing participation of women in the ICTs as targets and customers is considered a plus in the new digital economy.

A research conducted by the University of Harvard on the new way women feel both in the workplace and at home found out that they still feel underestimated in the workplace and undervalued in the marketplace (Silverstein and Sayre, 2009). Companies need to target women as individuals who need much more attention and space than their counterparts in terms of work-life balance incentives, opportunities, but also as customers. Improving innovative and product quality through the inclusion of women in product design processes is certainly an advantage. Women's inclusion in software production and website management may increase the attractiveness of women towards ICTs as well. Women in fact not only will represent one of the largest market opportunities in our lifetimes but also will be an important force in spurring a recovery and generating new prosperity (Silverstein and Sayre, 2009).

However, as previous data demonstrated, the gender industry gap in ICT sector is still too marked and wide. Despite it, the Fourth Industrial Revolution requires many shifts in the labour market to come, giving women unprecedented opportunities to be seized either as entrepreneurs, employees and even customers. That is the compelling reason to adopt some strategies to start addressing and sensibilizing more women towards the importance of the ICTs in all of its facets. The new emerging culture and the new social and civil awareness on these issues may sustain and drive future changes in the way women see

themselves in the Fourth Industrial Revolution, but also how the rest of the world frame and accept them in this digital picture.

In order to meet the urgent demand of workforce in specific sectors, like the ICT's one, it is necessary then that governments, companies and individuals adopt guidelines and measures that promote specific education and recruitment patterns of more individuals, and especially women. As the European Commission in 2013 pointed out in its launch of the Grand Coalition for Digital Jobs, to reduce skill-mismatch industries, governments and educational institutions should work together to provide people with more information and support in new job opportunities sectors and digital careers. A strict collaboration between private and public organizations is required, as well as between industries and universities, with the aim to attract more women in the ICTs fields (Acemoglu and Autor, 2011). Accordingly, starting from education ground is necessary, mentorship and training too. A sustainable working environment also is needed to fill the digital industry gender divide and that is possible only by increasing social awareness about these issues. The importance of filling the industry gender gap in the digital field is not only an economic and business issue. It is also an instrument to increase the self-awareness and well-being of women in society. And it is also about the importance to give them more opportunities to fully exploit the future possibilities that the Fourth Industrial Revolution brings about. The only way women can equally participate in the workplace and change the gender divide gap is to understand the world they live in. So, the issues explored in this chapter confirm that the new employment opportunities that the ICTs have to offer certainly give women the power to increase their working conditions, both in terms of high-paid jobs, but also in terms of new professional roles and leadership positions.

To better understand the place and the role of women in new digital economy, the next chapter will deepen the issues about the access, development and design, leadership and power in the ICTs linked to the role of women. Moreover, there will be presented two case-studies: one concerning a new emerging economy, the one of India, and one from a country which have suffered intensively the effects of the economic crisis of 2008, which is Italy. The aim is to answer whether the ICTS have an impact on the economic and social empowerment of women and whether this might occur in all cases.

Chapter III

“ Women’s socio-economic empowerment in and through ICTs”

The last chapter was dedicated to investigate the connections between the rise of the Fourth Industrial Revolution and the role of women in the ICTs employment sector. Since the ICTs are the fastest-growing sector, research findings demonstrate that they offer several careers opportunities and higher-paid job offers, including self-employment, to women.

Differently, the aim of this chapter is to investigate whether the ICTs may lead to a general empowerment of women, focusing on two cases: the one of India and the other one of Italy, two economically-, geographically- and culturally-divergent countries having two different ICTs patterns of access and development.

3.1 The problem of lack of statistical data: the need for sex-disaggregated data.

Before investigating the core content of the chapter and exploring our two case-examples, some considerations on the statistical data on women and the ICTs need to be expressed. One of the problems which this dissertation certainly reveals is the stunning paucity of gender ICTs available data.

Since the early 2000s a consistent segment of scholars studying women and gender in the ICTs were concerned about the the paucity of data on this topic. As several academics (Melhem and Tandom, 2009; Hilbert, 2011; Cummings and O’Neil,2015; Andersson and Hatakka,2017) clearly denounced, existing researches relating to the ICTs and precisley on gendered ICTs, are often country-specific, emerging more often from from developed than from developing countries. Moreover, available data are almost never sex-disaggregated. Hufkin and Huyer in 2008 wrote an important research article on the scarcity of gender ICT statistics. According to them, the main problem was that the lack of sex-disaggregated data due to lack of interests both by governments or private enterprises inevitably translates into the difficulty by policymakers to formulate targeted policies, plans and strategies (Hufkin and Huyer,2008). Since the ICTs are not gender

neutral, the need for quantitative tools for measuring the impact of the ICTs on women's voices and influence are essential in order to formulate far-wised policies (Cummings and O'Neil,2015). Fortunately, since 2004, more international and regional organizations started to collect sex-disaggregated data, but these are still not enough to build a comprehensive, specific view about this complex and multi-faced topic. Major efforts should be made by all international stakeholders to overcome this lack of statistical data both in developed and in developing countries (Melhem and Tandom, 2015). As the following cases show, in both such different countries there is a clear problem of lack of academic researches and statistical data which could help to picture the impact of the ICTs on women's socio-economic empowerment. The need for new definitions, new words and numbers are urgently needed to start identifying the social phenomena regarding the empowerment of women in the ICTs.

3.2 Women, ICTs and empowerment: social, cultural and economic factors.

The 2030 Sustainable Development Agenda sets gender equality and women's empowerment as the fifth policy objective of the very next future. The goal is explicated as to "achieve gender equality and empower all women and girls" (United Nations Sustainable development agenda, 2015). In the 2016 United Nations' Human Development Report, there is still too small room for the gender equality issue and few, if none, mentions about the empowerment of women and the ICTs. On the contrary at the 2016 World Summit on the Information Society and at the ITU Summit the importance of including women was recently reaffirmed and gender digital divide has been extensively reported. These discrepancies show that, although there is an increasing global concern for the issue on the empowerment of women in the ICTs, a common political direction is needed to face such complex, but fundamental theme. However, several reports enlight the benefits, but also the controversies, of the empowerment of women through and due to the ICTs. For instance, a panel study conducted by Nikulin over the time period from 2000 to2014 in 60 developing nations aimed at examine whether and how the ICTs shape and change work with regard to women's labour force participation in the market. The evidence of the study was mixed. As Nikulin held "the effects of ICTs on the labor market are complex as the impact of ICT on employment can be considered

both positive and negative” (Nikulin, 2017 p.18). This is due also to the nature of the new technologies, which, as it was previously mentioned in the first chapter, is difficult to study. The ICTs in fact can be considered both as a tool and as a sector (Nikulin, 2017). Accordingly, women can both find work or using ICTs as digital instruments to find employment or directly in a sector producing ICTs. Moreover, they also find new types of employment created by ICTs. So, the picture is quite fragmented and hard to test empirically. However, Nikulin’s study suggests that, although there is a general need for more international researches and comparisons on this topic, there is still a quite positive impact of ICTs on women’s empowerment. Nevertheless, the degree of explanation of the dependent variable (labour force participation rate) provided by the factors he used in his study is rather small (Nikulin, 2017).

Besides these economic impacts (they have been extensively treated in the previous chapter), it is interesting to examine the social and cultural impacts that ICTs have on women. Nowadays, a growing academic, private and public interest on the role of social and cultural empowerment of women and ICTs is emerging. There is much debate on the degree of shaping of social, cultural and political structure that new technologies have on society and, in particular, on women. As it was argued in the first chapter, new technologies have a technical and a social component, which are entrenched together and mutually shaping. According to Wajcman (2009) later feminists argued that technology is seen both as a source and a consequence of gender relations (Wajcman, 2009). Of course, these considerations are necessary to understand the relationship between women and ICTs, which is in part still difficult to investigate due to these reasons. The difficulty lies also in the fact that ICTs evolve rapidly and attitudes to gender evolve fastly too. This process which may be accelerated by the ICTs’ effects on social structures, is an ongoing process (Marcelle, 2002). Moreover, ICTs themselves are influenced by the context in which they develop. There is a huge difference in the access and use of ICTs in OECD vis-à-vis non-OECD countries. Economic factors, as well as cultural and social factors certainly influence it. This is the reason why data on ICTs differ so much among countries.

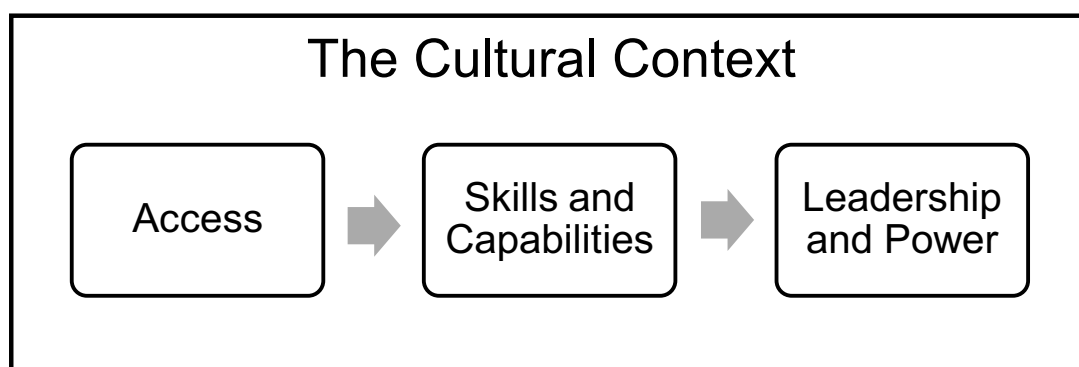
Maybe, the most intriguing question related to power is: do ICTs have the power to reshape the existing power structures of society or not? In the specific case of women, can the ICTs challenge the existing gender-based power relations and inequalities? Of

course, both are questions that offers still limited evidence. As O'Neil affirms "empowerment is a process of personal and social change through which women (or men) gain power, meaningful choices and control over their lives" (O'Neil cit. in Cummings and O'Neil, 2015). Accordingly, the crucial points are to investigate what is the role of women in ICTs and whether ICTs increase or not their influence and voice, both in private and in public spaces. "It is not just a matter of expanding women's opportunities in the labour market, it is also a matter of enhancing women's choices and capabilities at home, at school and in public life" (World Wide Web Foundation, 2015 p.7 cit. by Andersson and Hatakka 2017). To what concerns the role of women in ICTs, a decisive research conducted by Andersson and Hatakka in 2017 explores the social and cultural aspects which are embedded with women in ICTs' targeted policies in sixteen countries of the South and Southeast Asia. The authors discovered that women usually play three different characters in the ICTs: as 'Victimized Women', targeting women as the marginalized group, excluded from the information society; as the 'Motherly Women', that is mothers who play an active role in the spread and use of ICTs, because of their central role within families and communities; and finally as the 'Workingwomen in Becoming', women as a potential workforce (Andersson and Hatakka, 2017). This picture demonstrates how women are embedded in fixed social structures, that are reproduced in the ICTs policies and job sector. It shows also that the problem of gender inequality in ICTs should not be reduced to an issue of training or of opportunities to enter the job market, but it should also address the problem of how women are socially constructed in the information society. Otherwise, the risk is that ICTs may deepen existing inequalities between men and women, instead of reverting them, and enhancing the "sex-segregation of roles" and the consequent digital gender divide, both still existing nowadays (Sandys, 2005 cit. by Andersson and Hatakka).

Accordingly, the elements at the basis of the social and cultural empowerment of women through ICTs are complex and interconnected. Several elements have a decisive influence over it. For instance, as Melhem and Tandom (2009) pointed out, access and use of ICTs are important elements to increase the presence and voice of women in ICTs.

As Suresh (2011) claimed, access to Internet is essential to give women the opportunity to link each other and increase their collective control and agency. If there is not a material possibility to use ICTs, it is unlikely that women gain self-awareness and self-

esteem about their role in society. Also the possess of the skills and capabilities are fundamental in the process of the empowerment of women in ICTs. Eventually, this is the reason why education and training are so important. Access to the ICTs and information is of little value if women lack the skills and capacity to use them (Andersson and Hatakka, 2017). If more women have the capabilities and the skills to be ‘actively’ involved in ICTs, they may have a great influence over the process of design, development and content of ICTs (Cummings and O’Neil, 2015), hence they also have the control and power over ICT sector. As the following picture demonstrates, access to Internet and ICTs, learning the adequate skills and cabalities and patterns of leadership and power in ICTs, all of these components make up the way of socio-economic empowerment of women through and in ICTs. Of course the pattern is cultural-context specific, it varies from country-to-country, from that the importance to formulate specific, not generic policy programs.



Certainly, this pattern toward leadership and power of women in and thanks to ICTs is not linear. As it was mentioned in the previous chapters, the mutual changeability of new technologies makes each single factors dependent of and causal from the other ones. For this reason, it is important to keep analyzing these issues to gain more data for future comparisons and studies. To this purpose, the cases presented in the next sections serve as examples to prove how different factors, social and cultural context, but also how different policies and targeted programs influence the socio-economic empowerment of women both in ICTs and thanks to ICTs.

3.3 Case 1: The Italian case.

Italy is one of the 28 Member States of the European Union, so it is classified as one of OECDs countries worldwide and for these reasons, it holds a privileged position compared to the rest of the world, in terms of human, social and economic development. Indeed, according to the Human Development Index, the country is in the 26th position and with respect to the Gender Inequality Index (0.085) Italy holds the 16th rate in the world (UNDP, 2016). In terms of sex-dissegregated labour force participation, the data are less satisfactory since the industry gender gap is quite extensive: in 2016, the male labour-force participation was 65,5% vis-à-vis 47,2% (Istat, 2016). Data show huge discrepancies in terms of female labour-force participation between regional areas, with a difference of 23% between the North of the country and the South (Istat,2016). In this case, the data on labour-force participation are quite interesting since they reflect the socio-economic disparities existing between men and women, both nationally and regionally. To what concerns the data related to the internet access of households, according to Eurostat Italians who dispose of an Internet connection are around the 77%. That is definitively positive. What about the making up of ICTs and employment sector in Italy? Although there is a lack of sex-disaggregated data on this topic, the Eurostat data collected in 2015 show a highly significant digital industry gap between men and women in Italy. The data on ICTs and the employment sector show that 86.2% of men are employed in this sector vis-à-vis 13.8% of women employed (Eurostat, 2015). The gap is stunning, although it reflects the existing gender digital gap of other OECD countries, like the US and the UK. According to a study on the relationship between women and new technologies in Italy, this gap begins early at a primary school level and persists consequently at the industry level (Boschetto et al., 2012) 1. A national-level educational system which aim is to evaluated the performance of students in different subjects at primary and secondary schools (INVALSI), in 2010 revealed an important difference between girls' and boys' attitudes toward school subjects: boys appear to be more engaged in mathematics and technological subjects than girls, who prefer instead social sciences and humanities. It has been argued that these cultural differences have a consequence of influencing the students' future career choices and job opportunities

(Boschetto et al., 2012). In the Italian case, it seems that the phenomenon of gender-stratification is going to determine the school performance at all levels for both boys and girls (Boschetto et al., 2012). At university, only 2% of girls vis-à-vis 12% of boys choose a tech career (Miur, Ministero dell'Istruzione, dell'Università e della Ricerca, 2009-2010 cit. by Boschetto et al. (2012). The major problem identified is that if the digital gap persists, this is translated into missed opportunities in the job marketplace. According to general data in fact, almost 90% of girls who pursue an ICTs career then have positive benefits in term of employment (Almalaurea, Università di Bologna 2010 cit. by Boschetto et al., 2012). Although, there is a slight gender pay gap in ICTs, the overall picture demonstrates that in Italy there are positive incentives to undergo an ICTs career, especially for women. However, this potential has not been exhausted by any means. To some extent, the results show that the digital divide reflects also the employment and income gap phenomenon which seem to be common to all 28 member states of the European Union (Vicente and López, 2011). To address the national digital divide, in 2007 the Italian Ministry of Education launched a plan called 'Piano Nazionale Scuola Digitale' in order to mainstream ICTs in Italian classrooms (since the early childhood) and to promote the use of new technologies both in children and in teachers (Avvisati et al., 2013). Before 2007 in fact, only 30% of Italian students used ICT as a regular tool in science classes, compared to 48% on average in an OECD country (Avvisati et al., 2013). Data showed also that on average in 2011 the proportion of adults who had never used the Internet was 38.5% vis-à-vis a European average of 24.3%. So, the central aim of the plan launched in 2007 was to boost the use of ICTs not just as a tool or an equipment, but also as a catalyzer of mainstream social and cultural innovations (Avvisati et al., 2013). Unfortunately, due to the small budget and the economic constraints which faced the country, the program did not speed up. ICTs entered Italian classrooms slowly with a regional diversified concentration. In 2013, another plan was adopted by the Italian Ministry of Education called 'Piano LIM', a measure to promote the introduction of interactive whiteboards in classrooms to support teaching and learning. However, this plan too is progressing very slowly, creating a discontinued experience of ICTs equipment at the national level (Avvisati et al., 2013). According to Artali and Martucci (2010), the slow pace at which these kind of educational programs were implemented is partly due to the scarcity in investment of capitals and resources by Italian political

institutions; low investments in human capital along with consistent cuts in technical and scientific research result in downward patterns toward innovation both in public and private spheres. Moreover, this negative cycle seems to hinder particularly women in the workplace. However, in the last years few steps towards innovation reforms were been carried on by the Italian institutions, thanks also to the complicity of the European Union.

In fact, all the efforts to increase the level of digital literacy and ICTs competence of the country are greatly supported by the European Union and integrated in the European Commission annual guidelines which are addressed equally to all its member states. In recent years, in order to narrow the existing digital gap of the member states, the European Community has launched a series of development programs and devised specific guidelines to increase the participation of girls and women in ICTs. The 2020 European Commission Digital Agenda has in fact the purpose of promoting access and use of Internet for all, investing in digital innovation, promoting digital literacy, skills and inclusion, facilitating the collaboration between public and private actors and educational stakeholders. Indeed, it is clear that the main concern of the the European Union is to address and resolve the present and future shortage of labourforce in ICTs, which affects greatly the economic trends of the European area. In recent years, Italy is trying to keep in synchrony with the guidelines of the European Commission focusing of the gender digital employment divide. To enhance the participation of girls in ICTs programs at university and to actively sensibilize the civil society on these topics, the Italian Ministry of Education together with the department for Equal Opportunities is launching a series of mainstream projects to address the stereotypes related to the gender stratification existing in the educational system and in the tech employment sector (European Commission Report, 2017). The set of initiatives called ‘STEM Month-Women Want to Count’ was just one of the recent Italian series of programs aimed at narrowing gender gap for career choices. In 2015, Microsoft Italy, in partnership with ITU, other private stakeholders and with UN Women launched a program to promote girls in STEM called ‘Pink Cloud’ (La Nuvola Rosa), inviting thousands of Italian and international women to explore the opportunities offered by the digital world, through courses, seminars, events and networking. The project had a clear purpose of promoting the empowerment of women through and in the ICT sector. Besides these programs,

several initiatives have been promoted since 2016 like ‘MakeHer’, ‘Ragazze Digitali’, ‘Informatica sarà Lei’, ‘Nerd project’. All of these projects boosted by public universities, educational stakeholders and private actors have in common the aim to combat gender stereotyping in ICTs and promoting a ‘computing’ culture between girls and women. The final purpose, supported by positive European data trends, is to implement the employment opportunities for women in the ICT sector and, generally, to boost the socio-economic empowerment of women. Indeed, the latter constitutes in an ultimate end a invaluable resource for the economic recovery of the country. According to a research conducted by the Centro Nazionale Economia e Lavoro (CNEL) in 2004, in Italy the potential for increasing women’s employment opportunities in the ICTs is enormous. The Italian counterpart of Cisco Systems had evaluated the Italian economic background and it had effectively stated that women can fill the gap in the skills shortage in the newworking and ICTs flexible occupations (CNEL, 2004). Of course, there are also some critics and fears that new kinds of flexible jobs will lead to an increase in part-time, low-paid jobs, with the effect of undermining the socio-economic condition of women. Data evidence is not so encouraging. To what concerns the analysis of the types of ICT occupations held by women, data enlighten a not entirely positive situation. Patterns of sex-segregation at workplace occur: a great number of women occupy low entry level jobs or part-time jobs like data-entry or call-center workers; moreover, women occupy the most of junior level jobs in ICTs vis-à-vis men who hold senior role positions. Despite these negative trends, the ICTs employment sector still shows great potential of growth for women, provided that national targeted policies on this issue are to be implemented at very short notice. Accordingly, the need for a social self-awareness on the opportunities offered to women by new technologies is essential to control the future negative side-effects of the Fourth Industrial Revolution. Social awareness may be boosted by the increasing number of targeted programs aimed at reducing stereotyping in ICTs. And this is exactly the road that Italy has taken since the last years. Nowadays, clear positive signs that confirm that a growing social awareness, on the topic of women, empowerment and ICTs are spreading in the country. As it was mentioned in the first paragraph of this chapter, more statistical data on the improvement of Italian women’s socio-economic opportunities in ICTs are needed in order to study and specifically address targeted policies and programs; so far, sex-disaggregated data on this

topic have not been yet extensively collected and analyzed. However, thanks also to the great contribution of the data collected at the European level positive outcomes to what concern the economic and social opportunities given to women through ICTs are increasing. They demonstrate that in a country like Italy still currently affected by a harsh economic crisis, huge cultural and social inequalities slow, but steady changes are possible and attainable. The “silence transformation” (cit. by CNEL report, 2004 p.) is happening, but it needs great support by the political, civil and private national apparatus.

3.4 Case 2: The Indian Case.

The case of India is a peculiar and contradictory one. India does not belong to OECD countries, although in the last decades it faced an important wave of economic expansion and development. Apart from its geographic extended territory and a spiralling growing population, the country suffers from severe social and economic internal disparities. According to the United Nations Human Development Index, India is ranked 131st in the world, with a Gender Inequality Index equals to 0.530, which is highly superior to the average of OECD countries (0.06-0.08) (UNDP Report ,2015), data which make India labelled as ‘developing’ countries compared to ‘developed’ countries. ICTs provide unique opportunities for human development, especially in developing countries (Suresh, 2011). The empowerment of women in and through ICTs is one of the principal elements emerged by the digital information revolution. However the relationship between ICTs related to women empowerment and gender equality is different in nature in developing and developed countries. What emerges in the analysis between women and ICTs in developed and developing countries is that in most of developed countries most of the researches on the impact of information technology on gender and work deal with the association of men with technology and power. On the contrary, in in developing countries women are analyzed not only in terms of their relationship with the patriarchal structures of power in ICTs, but also analyzed in terms of Western dominance over innovation and as a source of technology (Arrawatia and Meel, 2012). Since the 2000s, the most influential ICTs companies started offshoring their industries towards countries like China and India, operations which offered a great boost in the ICT economic sector of these countries. According to a 2012 report by the International

Communication Union (ITU), India is the largest exporter of computers, softwares and information services (Powell and Chang, 2016). Nevertheless, the economic benefits interest a small percentage of Indian women since they oftenly are employed in low-sectors, low-paid jobs, like data-entry level, botton-levels positions of the ICT industry. Those outcomes are syntoms of the fragile social and political position of women in the Indian society. Overall, the position of women in the Indian society is quite complicated and fragmentated with great disparities in the matter of economic opportunities and resourcefoulness between men and women (Arrawatia and Meel, 2012). Sex-disaggregated data on the Indian labour-force partecipation show a wide gender gap: 26.8% of women vis-à-vis 55.5% of men (Open Government Data India, Census 2011). This picture demonstrates the level of socio-economic deprivation of a large sector of women in society. To what concern the industry data on ICTs in India, the 2017 World Economic Report found out that the ICTs ranked first as current and future largest industry of the country. On the front of on women and ICTs, evidences are controversial. The problem of lack of sex-disaggregated data on ICTs employment sector and women greatly hinders researches. In general, there is a massive difference between women in urban settings vis-à-vis women in rural settings. Overall, data founded by a report of the World Web Foundation in 2015 showed that in New Delhi 43% internet users are male and 47% are female, whereas only 29% of women used internet to look for a job (World Wide Web Foundation, 2015). Data also show that only 18% of the overall population have access to internet. The other 72% do not have access to internet and they are probably living in rural settings. These indicators demonstrate that a sex-disaggregated data are not generally available on Indian women and ICTs, but more importantly that in India huge discrepancies exist between women belonging to different social and geographic contexts. In the past decades, the central government started adressing the problem of digital illiteracy with national, wide-spread programs and campaigns which nevertheless have positive impact on urban settings, but few effects on rural settings.

Since 1986, the Indian Government started to promote the use of ICTs in school, a program which was included in the 'National Policy of Education', aiming at improving the quality of national education. In early 2005, the program was expanded and ICTs have figured in the norm of schooling reccomended by the Central Advisory Board of Education. In 2012, the Indian Department of School Education and Literacy in

collaboration with the Ministry of Human Resource Development launched a series of initiatives called 'ICT Policy in School Education', whose purpose is to enhance the holistic development of education and to offer precise guidelines to all the States of the country. The final purpose is to promote "universal, equitable, open and free access to a state of the art of ICT and ICT enabled tools and resources to all students and teachers" (National Policy on ICT in School Education Report, 2012). These programs show the political and social efforts made by the central government to coordinate and improve the digital literacy level of pupils in schools. What emerges from the report is that there is neither differences in ICTs targeted school programs nor mention to differences between girls and boys in attitudes towards ICT subjects in schools. Of course, this element can be read both in positive and negative terms. Differently from most of OECD countries, in India there is high percentage of girls enrolled in ICT university programs: 42% of undergraduated students in ICT programs are girls, which is more than double the proportion of girls in US (Government of India Survey, 2012-2013). Women are highly represented in the Indian software industry and recently the environment appears more and more 'women-friendly', with the creation of ICT engineering female colleges (Powell and Chang, 2016). However, as it was mentioned before, the Indian ICT sector is highly stratified. The potential of gaining high-level, senior and managerial roles in the sector is really high for women, but social, cultural and 'gender-stratified' stereotypes hinders the female upward mobility in ICTs. The problems appear to be mainly social and political. Although in the last years great efforts have been made to introduce ICTs in school as tools to equally increase the digital capabilities and skills of students, at an employment level the relationship between ICTs work and women is highly problematic, with less policy-targeted incentives and massive social and cultural barriers. For instance, many studies demonstrates that social and structural barriers cause women to drop out of the ICTs industry. The lack of work benefits, the incumbency of family reasons and the lack of suitable employment opportunities are among the causes of the underrepresentation of women on the board and senior management of ICTs companies, regulatory organizations and private industries (Suresh, 2011; Powell and Chang 2016).

As it was mentioned before, the analysis related to ICTs employment sector and Indian rural women makes up a different story. In fact, differently from large urban centers, in rural areas women do not even have the opportunity to accede to computers

and to Internet. The main problems consist in the access to Internet and to the skills necessary to use it, which generates the national massive gender digital divide. Nevertheless, in recent years, several ICTs development programs were implemented in rural settings with quite positive outcomes for socio-economic empowerment of women. For instance, the Self-Employed Women's Association (SEWA) project targeted 800 villages in Gujarat, with the aim to promote local income through ICTs. Thanks to satellite communication and Internet-based programs they tried to develop managerial skills among women workers, focusing on women who worked in the agricultural sector (Suresh, 2011). Another interesting project, called 'e-Seva Centres', consists in the setting up of internet-based centres delivering services to citizens in the poor district of Pradesh, managed entirely by women. The program ran positively, with more than 384 e-seva centres run by women of small cities and villages (Melhem and Tandom, 2009). The same positive outcomes have been found for women living in the state of Tamil Nadu, the rural South-East part of India. The Sustainable Access in Rural India (SARI) project consisted in the building of hundreds of internet kiosks in more than 50 villages, run as self-sustained business. Thanks to the equal platforms where women can build on their personal knowledge and experiences, these kinds of development programs did not upgrade levels of patriarchy, but instead they functioned like 'great equalizer' tools (Best and Mayer, 2007). Accordingly, thanks to the use of ICTs through the installation of internet portals, internet kiosks and centres avenues for rural women economic empowerment are created with great benefits also in terms of social and self-respect. Earning an independent income in fact is at the basis for "individual autonomy, increased agency and control and frequently, increased self-esteem and self confidence". (Huyer, 2006, p.30 cit. by Arrawatia and Meel 2012). In India, and in most of developing countries ICTs play a fundamental role also in the political empowerment of women, enhancing their voice, participation and influence. Thanks to their degree of higher connectivity, ICTs enable women to virtually meet and augmenting their power of decision-making and collective action, thanks also to the use of platforms concerning e-health, e-education and e-governance. As Suresh (2011) pointed out: "ICT have the potential to digitally link each other and every woman in the world, which opens up endless possibilities for information exchange" (Suresh, 2011, p.18). Overall, these characteristics of ICTs offer enormous potential opportunities to boost the political,

social and economic empowerment of Indian women, but also of each single women of the world.

As the previous analysis has demonstrated, the picture of Indian women in ICTs is highly fragmented and patchworked. A small percentage of the female population is highly educated in ICTs and highly motivated; however, data shows also that a lack of ‘gender-sensitivity’ in the workplace very often appears to be the main barrier against women economic progress in the ICTs sector. Women are also underrepresented in ICTs sector decision-making structures, comprising policy and regulatory institutions and board of private organizations (Powell and Chang,2016). In rural contexts, women lack basic access to computers and ICTs, but whenever they are given the opportunities, skills and capabilities necessary to learn and work, they benefit the most from ICT socio-economic empowerment. Moreover, what emerges from the overall picture is that “national policies and strategies have not yet taken in consideration this unexplored potential pool of intellectual inputs. With meek training and awareness programmes indian women can make a big transformation” (Arrawatia and Meel, 2012, p. 103).

However, recent efforts have been made to enhance digital skills in schools and educational settings.To sum up, great adjustments need to be made in India’s policies as well as in OECD countries to let women exploit their full potential in ICTs.The next section aims at giving some insights into the policy suggestions that should be implemented by central governments, private or public organizations and education stakeholders in order to create and sustain ICTs networking processes for women’s empowerment.

3.5 Women, ICTs and empowerment: policy and regulatory frameworks.

As Powell and Chang (2016) pointed out: “examining case studies of specific countries sheds light on the strides women have made and the barriers they continue to face in the ICT labor market, as well as variations across countries, regions and cultures” (Powell and Chang, 2016, p.5). What is clear so far, is that there is not ‘one policy fits all’ rationale behind the measures, policies and targeted programs that should be implemented to enhance the socio-economic empowerment of women through and in ICTs. The coming of the Fourth Industrial Revolution has brought about new

opportunities for women in ICTs to increase their chance of fully being included and integrated in the workplace of the very next future. As it has largely been analyzed in this dissertation, integrating ICTs in school curricula is fundamental in order to start early in the building process of self-confidence and overcoming cultural stereotypes of girls. Creating mentorship for girls is essential part of the necessary patterns toward reforming school programs. Of course, implementing educational goals is a great step but it is not enough to address the gender digital gap. Government and private stakeholders should also work together to guarantee equal access and usage of Internet and ICTs, especially in developing countries where women still lack sufficient resources to accede to the Web (see the Indian Case). Once the women are guaranteed enough skills and capabilities to work in ICTs they should be given the capacity-building tools to work equally in the ICTs sector; they should be given not just technical tools, but also a broader positive capacity-building. “Governments, NGOs should design more employment and job skills training initiatives to steer women toward jobs that build ICT skills” (Powell and Chang, 2016, p.10). It is especially through the acquisition of technical tools and ICTs-knowledge that women can fully play an active role in ICTs, especially through the design and development of content-specific products and knowledge (Cummings and O’Neil, 2015). Equally participating to the process of design and development of ICTs means having *the total control of the rationale behind it*. This process is fundamental to avoid that “ICT usage and consumption would mirror pre-existing gender differences that have been engrained for centuries and that class-based inequalities would still increase overall” (Melhem and Tandom, 2009 p.). To what concerns the existing barrier in ICT employment sector instead, governments, public and private stakeholders should promote flexible work policies, with the primary purpose of facilitating women working conditions and employment benefits and paybacks. Certainly, they should do it through a system of monitoration and critical assessment, but with the final purpose of creating a supportive environment. They should also sustain women in senior ICTs roles. The lack of women in senior ICT board roles lead dramatically to a lack of equal and fair leadership and power in the sector. Lack of women at decision-making positions negatively impact return on sales, invested capital of companies and generally negatively impact the macroeconomic trends of countries. Moreover, as Hafkin pointed out, empowering ICT knowledge of women is not just a matter of economic growth, but it is

especially a matter of empowering and developing all sectors of society to increase the quality of people's lives. Lastly, in order to clarify on the empowerment of women in and through ICTs, it is important to underline the necessity of sex-disaggregated data to formulate far-wised politics and programs on this issue. As the majority of the academic researches and report explained, without a consistent amount of data on women and ICTs, on their relationship in the employment sector and in the socio-political sphere, it is impossible to have a in-depht and detailed view on it, with the riskof missing concrete oportunties to intervene on the issue. Monitoring the phenomena is essential to make comparison and analyze what policy is working at country-based level and what are the programs that successfully works in order to promote comprehensive gender-mainstreaming internventions. Indeed, "policy and programmes should be seen not as one-time interventions, but as processes which allow learning from trial and error, and create spaces for the engagement of different social groups. The road ahead offers great possibilites on the role of ICTs for the promotion of gender equality". (Gurumurthy, 2006, p.47).

Conclusions

This dissertation approached several and complex themes related to women and the ICTs. This relationship is hard to analyze because of the rate at which both subjects evolve and develop year after year. Overall, the dissertation was constructed around three driving questions: whether there is a gender problem of underrepresentation in the ICTs and what are the socio-cultural barriers that affect it; what will be the place and role of women in the Fourth Industrial Revolution; and finally whether ICTs make possible and push through women's socio-economic empowerment. From a general analysis on worldwide data, the picture that emerges is that women are mostly underrepresented in ICTs (with some country-based exceptions); the most of researches in fact show that patterns of gender-inequalities persist in the field. Several barriers are found to be held accountable for the occurrence of the phenomenon. Generally, the study confirms the positive potential effect that ICTs may have on the promotion of gender equality both in the employment sector, but also more generally in the social sphere. In fact, the findings of this dissertation have been overall positive, enlightening successful outcomes for women in both the ICT employment sector and a general social betterment. Nevertheless, as previously suggested, many hindering elements and cultural barriers were found to affecting the process of full capitalization by women of the benefits striving from ICTs, especially in from the side of employment opportunities. Gender research has focused on persistent bias in social stereotypization of roles, but also in the workplace in the processes of hiring, autorship, recognition and promotion in ICTs. Indeed, in the first chapter the importance of targeting gender social and cultural stereotypes is stressed many times in order to prevent and avoid well-known patterns of segregation of roles in society. To this purpose, it is important to focus on early educational interventions aimed at sensibilizing both students, teachers and parents on the importance of technical subjects in schools and universities. Of course, one-intervention programs are not enough to tackle the underrepresentation of women in ICTs. Since the Fourth Industrial Revolution is advancing and progressing day-by-day offering hundreds of economic oportunities and benefits to fully exploit, girls and women should increase their own self-awareness and confidence about their growing potential in ICTs

employment sector. Educational and training programs have the potential to increase self-awareness, but they should be supplemented by social campaigns aimed at increasing the interest on this topic at a societal level. In the second chapter, the link between women and the new Fourth Industrial Revolution is extensively explored, with great outcomes. It is projected that women will have greater roles and spaces in the new ICT employment sector and digital economies as far as they meet the challenge. ICTs offers new employment opportunities and enough flexibility and creativity to meet the need of anyone, especially girls and women. There are some negative sides though. To counterfight the adversities brought by the digital revolution (part-time low-paid job, increasing automation of specific industrial sectors, too much flexibility leading to shiftwards of workplaces), government, civil and private stakeholder, ICT multinational companies should provide the ground on which women can make bloom their skills and abilities necessary to gain more power and control. So, it is necessary to agevolute women's opportunity to upgrade to senior board levels in ICT public and private organizations, for instance through granting employment benefits and work-life balance incentives. This processes not only will benefit women, but economic improvement of countries at large, bringing over fresh ideas, new perspectives and more socio-economic competitiveness. The third chapter explores how women's patterns of socio-economic empowerment develop, through the presentation of two country-based cases (Italy and India). Italy, as a member of the European Union and one of OECD's countries, represents certainly the example of a wealth-economic country which is struggling with the advancement of the new digital economy and ICTs. Italian and European data overall show a country with good level of access and use of Internet and ICTs, but at the same time a country where girls and women are highly underrepresented in the ICT sector, both at an employment level and at a decision-making one. Nevertheless, in Italy important signals of willingness to change the *status quo* of ICTs are coming both from political institutions and civil organizations. In recent years several educational and training programs are incentivized in schools, universities and private companies. However, Italy has yet much work to do on this topic, but the way is already paved. The case of India is quite peculiar and to some extent highly different from the Italian one. India is a complex, multi-faced country on the political, social, religious, cultural and economic level. India is a patchwork of cultures and customs. On this background, the

relation between gender and ICTs is fragmented; from one side women in large cities benefit from great educational and employment attainments in ICTs; from the other one, rural women lack of access to Internet and deprived by digital literacy. So, in Indian society, there is evidence of a cleavage between urban and rural women. Interestingly enough, women experience different kind of inequalities in ICTs, and at the same time they benefit from different targeted programs. Urban women experience patterns of sex-segregation roles in ICTs, like women in most of Western countries (included Italy); programs aimed at improve the employment benefits and incentives in public and private companies may certainly improve the pattern of leadership of women in ICT employment sector. Rural women on the contrary lack of the very access to internet and digital skills and capabilities. So, ICTs development programs, which comprise most of the time the material installation of internet kiosks or educational programs, grant excellent opportunities for women to become self-employed and acquire more digital skills. The two diverse cases demonstrate that overall ICTs can boost women's socio-economic empowerment provided that access and use of Internet, skills and capabilities in ICTs, incentives to leadership and design control through and in ICTs are provided and sustained by governments, NGOs, regional and international organizations, private and civil actors. Granting access to ICTs is necessary, but the simple usage of them is not enough. Through learning and training, women should take on roles "not simply as consumers and end-users of technology, but as designers, leaders, and shapers of the computer culture" (American Association of University Women 2000, 4 cit. by Aspray and Cohoon, 2008). With this background, women can finally take advantage of the plenty of opportunities offered by new ICTs, both economically and socially. So, targeted programs are needed, but not to address women as "diverse" from the rest of society, but to better include them in the processes of decision-making. The socio-economic empowerment of women starts from small but focused steps; to this purpose, as mentioned many times in this dissertation, the need for sex-disaggregated data and quantitative/qualitative researches is compelling in order to formulate valid and effective policies and to better tackle the phenomenon of underrepresentation of women in ICTs. The importance to gain actual and relevant data is essential also in view of another rationale: to understand the complex and intertwined relations between new digital technologies and sectors of societies, women included. As I mentioned in the

Introduction, the new Fourth Industrial Revolution is advancing at a steady pace. Numerous and different questions were posed at the beginning of this dissertation, on the power of new technologies of shaping sectors of society and of perpetrating or reshaping gendered social structures of power. Part of the answers to these complex topics were found, but they were highly contradictory and partly incomplete. It is hazardous to affirm that the new information communication technologies and the Internet have the power to completely reshape existent social structures and gendered-structures of power. However previous data proved that new technologies have the character to powerfully influence networks of actors. In this dissertation the technicist, social, design, and actor-networks' views on technology prove to merge each others. Moreover, what clearly emerges from these findings is that ICTs and new technologies are not gender neutral, as the most of literature claims so far. The social component of ICTs relies on its *designed* part which give power to whom has crated and developed them.

In this sense the importance of investiganting how digital technology is evolving is fundamental for the betterment of society as a whole. Although these findings prove that it is hard to fully analyzed the relation between gender and ICTs, what emerges from the study is that ICTs may provide unique oppourtunies for human development a sa whole (Suresh, 2011), provided that they are inclusive and equal.

To conclude, ICTs may given women the oppourtunty to “be agents of their own development and own opportunities” (Melhem and Tandom, 2009 p,42), but only if governments, NGOs and private organizations start to realize the potential of this enormous social capital. A process of “gender-sensitivity” is essential to eradicate gender-based stereotypes, and this is possibile only through focused and responsible policies (Arrawatia and Meel,2012). At the same time, since ICTs have *per se* the power to positively change structural inequalities, affirmative actions should be taken, not to target women as diverse, but to including them in the decision-making process and development of ICTs (Andersson and Hatakka, 2017). So, these mutual processes of social structural changes through and in ICTs will definitely contribute to more gender-equal societies, with the role of women as the main leaders and developers of the technological and social future of humanity.

Riassunto della tesi in Italiano

“Donne e ICTs: un’analisi sui fattori sociali, culturali ed economici che incidono sul rapporto fra genere e ICTs”

Le nuove tecnologie digitali hanno segnato l’entrata della civiltà nel ventunesimo secolo. Il ritmo di evoluzione di esse è incalzante ed incessante e provoca, a livello sociale e a più livelli, profondi mutamenti e cambiamenti. Per quanto sia difficile analizzare e comprendere in che direzione esse si stiano evolvendo è senza dubbio importante studiarne gli effetti a livello sociale, culturale ed economico per comprendere ciò che sta accadendo e per poter rispondere adeguatamente.

Questa dissertazione ha come scopo fondamentale quello di analizzare le relazioni esistenti fra genere e nuove tecnologie digitali, in particolare le tecnologie dell’informazione e della comunicazione, le ICTs. Poiché è difficile fornire una definizione corretta e coerente di ICTs, in generale il termine si riferisce all’insieme delle tecnologie che forniscono delle comunicazioni attraverso le telecomunicazioni. Oggigiorno l’acronimo più specificatamente si riferisce alle tecnologie di comunicazione *digitale*, quali Internet, reti wireless, le tecnologie audio-video e relativi software, che permettono agli utenti di creare, immagazzinare e soprattutto scambiare informazioni.

La rilevanza insita nello studio della relazione fra genere e ICTs è di fondamentale importanza in quanto entrambi sono ambiti sociali trasversali e contingenti. Molte sono le sfaccettature della relazione e al tempo stesso è difficile studiarne le implicazioni in quanto entrambi i soggetti si evolvono a ritmo sostenuto nella società. La presente dissertazione si concentra nello specifico sul rapporto fra ICTs come abito di lavoro e genere, inserita in un’analisi più ampia relativa agli aspetti sociali, culturali ed economici che tale relazione implica. A tale scopo, questa dissertazione è costruita attorno a tre quesiti cardine, attorno ai quali a loro volta sono costruiti tre capitoli: quale sia il rapporto fra donne e ICTs nell’ambito di lavoro, quali siano le barriere che si interpongono allo sviluppo in positivo di tale relazione; quale sarà il ruolo delle donne nella Quarta Rivoluzione Industriale, se tale cambiamento porterà o no dei benefici nell’ambito lavorativo per le donne; e infine se tale relazione possa migliorare il processo *empowerment* sociale ed economico femminile.

Nel primo capitolo, dapprima viene esposto un dibattito classico nella letteratura della sociologia riguardante la segregazione dei ruoli a livello degli ambiti lavorativi e la divisione del lavoro. Viene dunque esposta la teoria della “divisione dei ruoli” secondo la quale dagli anni 50’ ad oggi la società si sia costruita attorno a delle strutture fisse e prestabilite riguardanti la divisione dei ruoli ed ambiti lavorativi fra entrambi i sessi. Ciò che emerge dall’analisi è la rigidità a livello sociale con quale tali ruoli vengono riprodotti. È interessante a questo punto analizzare come le nuove tecnologie si siano interposte a questa struttura sociale prefissata di divisione dei ruoli e di conseguenza degli ambiti di competenza lavorativi. Dal momento che le ICTs hanno il ‘potere’ di rimodellare le strutture sociali e culturali preesistenti (Gurumurthy,2004), è necessario capire in che modo e a che livello tali strutture sociali vengano cambiate. Per quanto sia ad oggi difficile capire l’entità dell’impatto che hanno a livello dei legami sociali strutturali e di potere, è indubbio che esse ne abbiano. Da una parte, è il modo stesso di comunicare attraverso le ICTs e di scambiare messaggi che implica un inevitabile rimodellamento strutturale a qualsiasi livello sociale (ciò che viene denominata ‘dimensione sociale delle nuove tecnologie’); dall’altra è il modo in cui vengono ideati, creati e sviluppati i contenuti scambiati, ma anche i software con cui vengono scambiati i messaggi che ha una notevole importanza (dimensione ‘tecnica’ della tecnologia). E’ perciò essenziale capire come vengano riprodotte le strutture sociali pre-esistenti di genere nell’ambito delle ICTs, per comprendere chi crea, sviluppa e controlla le nuove tecnologie stesse. Analizzando le ricerche statistiche a sociologiche a livello europeo e internazionale, ciò che emerge sino ad oggi è una relazione ambivalente e complicata fra donne e ICTs, con modelli di netta segregazione femminile nell’ambito sociale e lavorativo delle ICTs. Ciò che è chiaro è un netto squilibrio fra forza di lavoro maschile e femminile nelle ICTs, con il presente settore occupato per lo più da forza di lavoro maschile. Per esempio, riportando un’indagine statistica svolta dell’Eurostat nel 2015 riguardante le ICTs e forza lavoro, i dati dimostrano chiaramente un *gender industry gap* notevole, con una forza lavoro femminile pari a circa al 16% vis-à-vis 84% di forza lavoro maschile (Eurostat, 2016). Il quadro generale sociale dunque descrive una situazione di sottorappresentazione femminile nel settore ICTs a tutti i livelli). Vi è una generale tendenza alla riproduzione delle strutture di potere di genere anche dunque nelle ICTs, portando alla ovvia conclusione che le ICTs non siano neutri dal punto di vista di

genere (Hufkin and Huyer, 2008). Inoltre ciò che emerge a livello generale è una poca confidenza delle donne nel settore ICTs. Tali attitudini negative dei confronti delle nuove tecnologie si traduce nell'ambito lavorativo in minori opportunità per le donne nelle ICTs sia in ambito d'impiego che di prospettive individuali di carriera.

A questo punto è importante indagare i motivi che portano a tale dislivello. Dopo un'attenta analisi, emergono fattori sia strutturali che sociali che portano a tale squilibrio. La maggioranza degli studi a livello strutturale dimostra che tale divario nasce a livello scolastico sin dalla scuola primaria, per poi prolungarsi a livello post-universitaria durante l'ambito lavorativo. Infatti, la scelta relativa alla carriera e al tipo di ambito lavorativo degli studenti è profondamente condizionata sin dalla prima infanzia sia dal tipo di curriculum scolastico che dal ruolo di insegnanti e mentori. Vi è assoluta esigenza infatti di far conoscere agli studenti in ambito scolastico e a più livelli materie di stampo digitale- tecnologico, per poter avvicinare sia i ragazzi che le ragazze a tali materie fin dai primi anni di scuola. In questo senso sono infatti di fondamentale importanza i programmi e le riforme istituzionali in ambito scolastico e universitario atte a introdurre nel curriculum scolastico la conoscenza delle ICTs sempre più approfondita. A livello sociale, maggior enfasi viene data al ruolo fondamentale degli insegnanti, dei compagni di scuola, ma soprattutto della famiglia. Secondo dei recenti studi condotti da Aspray and Cohoon condotti negli Stati Uniti in diverse scuole e università del paese, uno dei motivi fondamentali che impediscono alle ragazze di intraprendere una carriera in ambito tecnologico è proprio lo stereotipo sociale negativo e controproducente creatosi a livello sociale a causa dell'influenza di figure di riferimento portanti a livello educativo quali quelle degli insegnanti e della famiglia. Tali influenze sociali influiscono sul processo di 'identificazione-del sé' a livello personale, con il risultato che molte ragazze non si identificano in un ambito lavorativo inerente alle ICTs, perché considerato ambito prettamente maschile. Ecco dunque che, forti stereotipi sociali, hanno ripercussioni poi nell'ambito lavorativo, con conseguente segregazione dei ruoli anche e soprattutto nell'ambito delle nuove tecnologie. Questo processo sociale ha delle evidenti ripercussioni negative nel mercato del lavoro, con un *industry gender gap* marcato e un risultato sfavorevole in termini di opportunità di carriera per le donne in un ambito in crescita costante qual è quello delle ICTs.

Nel secondo capitolo viene successivamente analizzato come cambierà il mercato del lavoro nel prossimo futuro e verrà analizzato nel dettaglio il settore delle ICTs in rapporto al ruolo crescente che le donne avranno e potranno avere in tale settore lavorativo.

Il settore delle ICTs è diventato e diventerà un settore di crescita economica considerevole a livello industriale negli anni a venire (World Economic Forum, 2016). Numerosi studi e report di organizzazioni internazionali riportano un notevole incremento a livello economico e d'impiego nelle ICTs nel prossimo decennio. Con una situazione lavorativa sempre più fragile a causa degli effetti travolgenti della Quarta Rivoluzione Industriale, fra cui una crescente automazione del lavoro, un impiego sempre più massiccio e capillare dell'intelligenze artificiali e della robotica, è essenziale investire sui settori d'impiego e industriali che avranno più chances di sviluppo e crescita da qui al 2030 (World Economic Forum, 2016). Le proiezioni economiche dimostrano che nel contempo le donne acquisteranno sempre più spazio nel mondo del lavoro. Dunque è fondamentale indagare quale sarà il ruolo che le donne avranno nelle ICTs dato il potenziale enorme di crescita di tale settore. Nel complesso, vi sono dati positivi che lasciano dedurre una futura potenziale crescita delle donne nel settore. Sono proprio infatti le caratteristiche di flessibilità e parità che caratterizzano tale ambito ad agevolare le donne a intraprenderne una carriera. Tuttavia, parallelamente, a livello governativo e privato è necessario che vengano adottate delle misure per incentivare l'interesse delle donne a rivolgersi verso tale direzione e, soprattutto, misure che sostengano le donne a intraprendere ruoli di *leadership* in tale ambito, non di semplice impiego. È fondamentale infatti che le donne, non solo si affaccino al mondo delle ICTs in ambito lavorativo, ma soprattutto che abbiano capacità decisionale, di controllo e guida in tale ambito. Tale punto si ricollega infatti alla dimensione e al potere sociale e tecnico delle ICTs, quali tecnologie in grado di promuovere inclusione e parità sociale e di ridisegnare le esistenti strutture sociali di genere. Questo processo non produce beneficio solo per le donne, ma anche il benessere e lo sviluppo dell'intera società, la quale va a beneficiare a livello economico di maggiore innovazione e competitività e a livello sociale di maggiore sviluppo e benessere. Tale riflessione introduce al terzo capitolo di questa dissertazione, in cui viene analizzato il potenziale di *empowerment* sociale, culturale ed economico

delle donne nell'ambito delle ICTs, ma anche attraverso l'utilizzo delle ICTs in ambito lavorativo.

Il terzo capitolo infatti ha lo scopo di analizzare il processo di *empowerment* sociale ed economico delle donne nel settore delle ICTs, ma anche in termini di utilizzo delle ICTs come mezzo. A tal proposito vengono presentati due casi nazionali in ambito internazionale, l'Italia e l'India, che seppur presentando condizioni culturali, sociali ed economiche profondamente diverse fra loro, rappresentano due casi importanti per capire gli effetti dell'ICTs sul processo di *empowerment* femminile. L'Italia, in quanto membro dell'Unione Europea e uno dei paesi dell'OCSE, riveste sicuramente una posizione privilegiata in termini di accesso e possibilità lavorative nelle ICTs. Tuttavia dopo un'analisi sociale ed economica, ne risulta il quadro di un paese in cui le differenze di genere in tale settore sono piuttosto pronunciate e radicate a livello sociale. Vi è generalmente una segregazione negli ambiti lavorativi dovuta a una stereotipizzazione dei ruoli sociali, che agisce a più livelli e in più settori della società. Tuttavia negli ultimi anni, grazie a politiche specifiche promosse a livello europeo e nazionale, l'Italia sta lentamente, ma progressivamente adottando misure sia in ambito scolastico che lavorativo atte a promuovere il rapporto fra donne e ICTs, grazie anche a un'attenta sensibilizzazione da parte di centri di ricerca nazionali, università e campagne sul web. Numerosi sforzi a livello di presa di consapevolezza di genere si stanno evidenziando a livello generale atti a creare nuove strade e processi di *empowerment* femminile. Tuttavia il processo di crescita è frammentato a livello nazionale; ciò è dovuto principalmente a una mancanza di fondi e incentivi a livello economico e rallentato a livello politico e istituzionale a causa di una forte differenziazione regionale (Boschetto et al., 2012).

L'India rappresenta una situazione completamente differente, essendo una nazione geograficamente e demograficamente ampia, dalle molteplici culture, situazioni sociali ed economiche diverse e complesse. In questo quadro, la relazione fra donne e ICTs è sfaccettata. Vi è principalmente una forte differenza a tutti i livelli fra aree urbane e rurali, e in termini di accesso a ed opportunità di lavoro nelle ICTs fra donne che vivono in contesti urbani e donne che vivono in contesti rurali. È interessante notare come in India le donne che vivono in contesti urbani sperimentino una relazione con le ICTs simile a quella dei paesi OCSE, con grandi, se non maggiori, opportunità a livello educativo e di lavoro nelle nuove tecnologie, ma con problemi di tipo sociale e culturale

a livello di leadership e controllo delle ICTs. Diversi sono le barriere, sia strutturali che culturali che impediscono alle donne di ricoprire ruoli di amministrazione e potere nel settore delle ICTs. Mancanza di benefit, opportunità di crescita a livello di carriera, impegni familiari sono fra i fattori che maggiormente incidono sul processo di *empowerment* femminile nelle e attraverso le ICTs. D'altra parte invece, le donne che vivono in contesti rurali sperimentano problemi di natura differente. In primo luogo, vi è un problema ad accedere ad Internet; in molti contesti rurali infatti vi è una totale mancanza di infrastrutture adeguate. In secondo luogo, viene riscontrata un conseguente analfabetismo digitale, in termini di mancanza di abilità, capacità e strumenti per poter accedere e lavorare nelle ICTs. Di recente il governo centrale ha attuato una serie di misure per promuovere l'utilizzo delle tecnologie digitali a livello scolastico nella maggioranza degli stati della nazione. Parallelamente, molte organizzazioni indiane e internazionali hanno avviato dei programmi atti a promuovere lo sviluppo delle ICTs nelle regioni più arretrate a livello digitale; tali progetti riguardavano per esempio l'installazione nei villaggi di punti d'accesso ad Internet e programmi di educazione digitale e economica e per le donne, con il fine primario di promuovere il *self-employment* femminile in tale ambito (Suresh, 2011). Nella maggioranza dei casi tali progetti hanno avuto esiti positivi, dimostrando un netto miglioramento delle condizioni sociali ed economiche delle donne.

I precedenti casi hanno dimostrato nell'ambito della presente dissertazione, come le ICTs possano portare effettivamente a un miglioramento della condizione sociale ed economica femminile, sia intraprendendo una carriera in tale settore lavorativo sia sfruttando il potenziale che le nuove tecnologie possono fornire a livello di crescita personale e di auto-coscienza e affermazione sociale. Nel processo di empowerment in tale ambito vengono dunque evidenziati tappe ed elementi fondamentali: l'accesso alle ICTs, le abilità e capacità digitali per muoversi ed utilizzare le ICTs, e infine il ruolo di sviluppo, leadership e controllo di esse. Ovviamente tali elementi variano in base al contesto culturale di riferimento, ma affinché il processo di empowerment si compia, è necessario che tutte le tappe di tale percorso vengano affrontate in modo tale che le donne assumano un ruolo 'attivo' e non puramente 'passivo' nell'ambito delle ICTs (Melhem and Tandom, 2009; Cummings and O'Neil, 2015).

Infine, per promuovere tale processo viene sottolineata l'importanza dell'intervento di governi, ONG, multinazionali private e aziende nazionali, campagne di sensibilizzazione civile e sociale, attraverso programmi educativi a più livelli e incentivi mirati a promuovere l'utilizzo delle ICTs in maniera consapevole e attiva in ambito sociale, e promuovere le crescenti opportunità di lavoro per le donne in tale settore. In tale senso, viene sottolineata inoltre più volte l'importanza di raccogliere dati differenziati per entrambi i sessi nell'ambito delle ICTs. Lungo tutto lo sviluppo di tale dissertazione infatti, viene spesso nominato il problema della mancanza di dati riguardo la relazione fra genere e ICTs. Tuttavia, è proprio per ideare e di indirizzare più efficacemente programmi e politiche riguardanti le donne e le ICTs, che è necessario approfondire maggiormente sia a livello accademico che governativo lo studio di tale relazione. A tale scopo è necessario incrementare la raccolta di dati e di ricerche statistiche a riguardo. In questo modo non soltanto ne beneficeranno le donne in quanto categoria sociale, ma l'intera società.

In conclusione tale dissertazione ha lo scopo ultimo sia di chiarire e di gettare luce sul rapporto esistente fra donne e nuove tecnologie, ma soprattutto di dimostrare come tali ambiti, così importanti siano contingenti alla presente realtà sociale. Analizzare tali relazioni e ambiti sociali è fondamentale non semplicemente per una questione 'di genere', ma perché riguardano lo sviluppo e il benessere future dell'intera società. Le nuove tecnologie digitali avranno infatti sempre più influenza capillare a livello quotidiano ed è perciò importante capire in che modo esse avranno un effetto a livello sociale. Tale dissertazione ha dimostrato dunque che le ICTs hanno in sé un enorme potenziale sociale di inclusione e al tempo stesso offrono molte opportunità di riscatto economico alle donne. Tuttavia è necessario che le nuove tecnologie vengano ideate, sviluppate e controllate in maniera equilibrate da *tutti*, in modo tale che a beneficiarne non siano solo determinati segmenti sociali. Il potenziale sociale ed economico delle ICTs dunque è ampio e ancora parzialmente inesplorato. In un prossimo futuro, è proprio alle donne che spetta il ruolo di leader nel traghettare la civiltà nella Quarta Rivoluzione Industriale. Questa dissertazione ne dimostra l'incredibile possibilità ed evidenza scientifica.

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