THE LACK OF WOMEN IN THE IT INDUSTRY: THE CYBER SECURITY CASE

another aspect regarding access to ICTs

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Executive summary

In Argentina, during the 1970s, women amounted to 75% of the student body in university degree programs in Informatics. However, the percentage has dropped to a low of 18%. This tendency raises several questions that need to be addressed in order to stimulate discussions on access to ICTs. After all, this situation has an impact on job market opportunities in general and management positions in particular in the IT sector.

To begin with, the industry is not accustomed to a high level of female participation. Even worse, people with university careers in Informatics regard the low numbers of women in said field as normal. What is more, the cyber security industry has special characteristics that hamper the permanence of female professionals.

So, what happens with women who are working in the IT industry and, specially, with those who work in areas such as cyber security? How can we ensure that women currently working in the field of technology remain in the industry? What is the situation like for those women professionals who had to overcome several obstacles throughout their academic years as a result of their gender and now have to face a work environment that treats them differently? These aspects shed light on the debate regarding access to ICTs.

Introduction

When we speak of the digital gap and women's access to Information and Communications Technologies (ICTs), we may refer to different situations.

We could be referring to differences between men and women regarding their connection to a quality internet, to a differentiated access to devices (either cell phones or computers) and even to the capacity to use both the internet service and the technology.

It is worth considering what we understand by access to ICTs. For example, we could follow the approach taken by national and international forums, closely related to the idea of "connecting the disconnected", connecting the other half of the world, etc.[1]

The United Nations General Assembly recognizes the right to access the internet.[2] However, the enjoyment of said right depends on social equality, economic and cultural opportunities and on the political situation of each country. In 2018, nearly half of the world's population had access to the internet; and in 88% of the countries, men had more access to it than women.[3] Geographic location, age, education level, income and gender largely determine the extent to which people access the internet.[4]

According to a report on internet access recently published by the National Institute of Statistics and Censuses (INDEC, for its Spanish acronym), in Argentina it is estimated that 64% of urban households have access to a computer while 76% have access to the internet. Data shows that in the country 8 out of 10 people use cell phones and 7 out of 10 use the internet.[5] Age groups of 18 to 29 have registered the highest level of cell phone and internet use.

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1 The International Telecommunication Union (ITU), a specialized agency of the United Nations, declared in 2017 that more than half of the world's population is still offline of which the most disadvantageous live in rural areas, are poor, female, illiterate and aged. In particular, there are a great number of forums where access is discussed as well as forums such as Women 20 (W20), which focuses on how to bring women online.

2 United Nations General Assembly, "The promotion, protection and enjoyment of human rights on the internet.", 2012,

3 International Telecommunications Union (ITU), "Statistics. Global, Regional and Country ICT Data."2018, https://www.itu.int/en/ITU-D/Statistics/Pages/stat/ default.aspx

4 Web Foundation, *Advancing Women's Rights Online: Gaps and Opportunities in Policy and Research*, 2018, http://webfoundation.org/docs/2018/08/Advancing-Womens-Rights-Online_Gaps-and-Opportunities-in-Policy-and-Research.pdf

5 Technical report: *Access and use of information and communications technologies*, published in 2018. EPH, INDEC. https://www.indec.gov.ar/uploads/informesdeprensa/mautic_05_18.pdf

There is a slight difference between men and women regarding the use of ICTs. Men use the internet and the computer 1.7% more than women. Regarding the use of cell phones, there is barely any difference.

The introduction of the internet is steadily growing in our country and, while data provided by INDEC indicates that a fourth of the population lacks internet access, today Argentina is one of the countries with the highest connectivity ratios in the region. Many reports have also established that the connection speed is below world average rates and faster in large cities compared to the interior of the country. Besides, the cost of connectivity is one of the highest in Latin America, despite the fact that the quality of the service is lacking.[6]

This aspect of internet access is rather crucial, indeed. However, it is not the only aspect to be taken into account when it comes to women accessing ICTs. In fact, more and more questions are brought up: who cares about women having access to ICTs and what kind of access do we have in mind? Does access alone means women participate as users only or also as creators of technology? In addition, following Edward Snowden's revelations, more profound questions were raised as to whether connecting "disconnected women" means subjugating them as users to the existing business model based on data extraction. Internet connection models are also criticized when implemented at any cost, such as Facebook's initiative, Free Basics,[7] which proposes walled gardens and low quality internet.

Regarding the above, it should be said that universal formulas which offer access to internet, whatever the cost, to everyone without taking into account their social background (for example, offering restricted internet access to populations with scarce resources) ought to be reconsidered. In this sense, many women analysts and experts in access and gender[8] believe that public policies designed to connect people –and women in particular– to the internet ought to consider their cultural background, age differences and socialization patterns when addressing this kind of topics. The reason behind this is that each group of women poses different types of challenges depending on their age and geographical location and said challenges must be addressed by attending to women's specific needs. Making these parameters visible is crucial

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6 CABASE "Estado de internet en Argentina y la Región" 2nd semester, 2018 https://www.cabase.org.ar/wp-content/uploads/2018/09/CABASE-Internet-Index-II-Semestre-2018.pdf
7 Free Basics offers access to certain services –which vary according to country–, such as Facebook, Facebook Messenger, AccuWeather, BBC News and ESPN, which means internet users have restricted and limited access.
8 In the following article many women experts in access and gender are cited under the internet Governance Forum in 2016. https://www.genderit.org/es/feminist-talk/igf-2016-miradas-feministas-desde-guadalajara

to understanding the differences in terms of access and to allocating resources in order to overcome them. For example, it is essential to take into account the gender roles women adopt in their communities and the importance given to ICTs in the public life of those groups where they belong.

Hence, it is worth going deeper in the debate over what we understand by access and inclusion of "disconnected" people. This would also allow us to start thinking about the ways in which people may participate (especially women) in the creation of technologies.

Why is the production of ICTs related to access?

As previously mentioned, accessing the technology which allows women to connect to the internet is definitely important. All the same, inequality also results from the fact that there is little involvement on the part of women in the production of digital contents.

The limited participation of women in the production of contents for the internet means that their voice is almost unheard in the public arena. Consequently, the content shown on the internet reflects little diversity and less plurality, which results in the dissemination of biased discourses on the internet.[9] For example, according to Wikimedia (Wikipedia's Foundation), women make up 8 to 16 per cent of content editors worldwide[10].

It is noteworthy that women's limited access as users and creators of technology curtails the full enjoyment of life in society as we experience it nowadays. This also brings about consequences for democracy, which is impoverished due to the obstacles faced by half of the population regarding diversity and dissidence. With respect to violence against women, Special Rapporteur Dubravka Šimonović of the United Nations has clearly stated:

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9 Threats, mistreatment and harassment on the internet also act as buffers against access to ICTs and freedom of expression. However, these issues will not be dealt with in this document.
10 Gender bias on Wikipedia https://es.wikipedia.org/wiki/Brecha_de_g%C3%A9nero_en_Wikipedia
- *Gender issues in the digital world. Wikipedia and other communities* (report) https://upload.wikimedia.org/wikipedia/commons/1/1d/La_cuesti%C3%B3n_de_g%C3%A9nero_en_el_mundo_digital._Wikipedia_y_otras_comunidades..pdf
- "Nine Reasons Women Don't Edit Wikipedia", Sue Gardner's https://suegardner.org/2011/02/19/nine-reasons-why-women-dont-edit-wikipedia-in-their-own-words/

"Women human rights defenders, journalists and politicians are directly targeted, threatened, harassed or even killed for their work. They receive online threats, generally of a misogynistic nature, often sexualized and specifically gendered. The violent nature of these threats often leads to self-censorship. Some resort to the use of pseudonyms, while others maintain low online profiles, an approach that can have a detrimental impact on their professional lives and reputations. Others decide to suspend, deactivate or permanently delete their online accounts, or to leave the profession entirely. Ultimately, the online abuse against women journalists and women in the media are a direct attack on women's visibility and full participation in public life. (…) Online violence against women not only violates a woman's right to live free from violence and to participate online but also undermines democratic exercise and good governance, and as such creates a democratic deficit".[11]

Additionally, the limited participation of women in the creation of internet contents can also be noted in the technological industry. Based on a study conducted by Fundación Sadosky,[12] in Argentina, during the 1970s, women amounted to 75% of students in computer studies university courses. By the time this report was written, the percentage had come to a low of 18 per cent. This figure is alarming and of an exceptional nature. It is evident that the society we live in rests on a patriarchal organization model and the academy is not exempt. Regardless, it may be claimed that courses of studies such as law do not differ much from the rest of society in terms of their organization and parameters, and yet, women constitute almost half of the student body of said course of study.[13]

The small number of women in computer science courses has an impact on access to the job market and, in particular, to management positions in this sector. As a result, there is little visibility of women in the IT field and this contributes to the overall scarcity.

Some of the reasons cited to account for the loss of female students in this field relate to the cultural stereotypes built around girls' and women's capacity to perform in areas such as IT, computer sciences and mathematics. Some global reports indicate that the video game industry is a decisive factor when choosing degree programs related to ICTs.

11 Report of the Special Rapporteur on violence against women, its causes and consequences on online violence against women and girls from a human rights perspective. United Nations. Human Rights Council, 2018 https://undocs.org/es/A/HRC/38/47
12 Report produced by Fundación Sadosky: *Y las mujeres… ¿Dónde están?* http://www.fundacionsadosky.org.ar/wp-content/uploads/2014/06/Informe-sobre-Genero-final.pdf
13 "Radiografía de los universitarios argentinos: cuáles son las carreras más elegidas" La Nación, 2017 https://www.lanacion.com.ar/sociedad/radiografia-de-los-universitarios-argentinos-cuales-son-las-carreras-mas-elegidas-nid2034373

It is worth mentioning that the proliferation of stereotypes of women reproduced by the industry and the way they are portrayed are a determining factor of gender inequality in university courses such as science, technology, engineering and mathematics.[14]

The problem of a male dominated technological industry is that it creates products from a male hegemonic perspective and these are offered in a world where half of the population does not fit. Take for instance the products and strategies created in the security field using the concept of security as if it had a universal value. Creating digital security solutions which overlook key differences between risk models is dangerous for the most defenseless and vulnerable ones. Risk models are diverse and they respond to people's specific needs and activities. Hence, they differ greatly between women and men. We will go back to this subject in the next pages.

Apart from the challenge posed by women's participation in information technology, we should also worry about the (few) women who are currently involved in the production of ICTs. This topic is often neglected in discussions on access and the participation of women in IT, science, technology and mathematics.

Considering that since the 1970s the academy has been unable to maintain a steady percentage of women enrollments in Informatics degree programs –but quite the contrary–, the industry, consequently, is not used to an increased participation of women. Even worse, people with an academic career in Informatics regard the small visibility of women as natural and thus do not interact much with female classmates or peers. This has a direct impact on the industry. On the one hand, it results in work environments with gender inequality. In addition, in university courses, the interaction with female classmates has been little and marked by discrimination and difference in the way they are treated, as a result of their gender. These patterns of socialization later influence the workplace too. As stated by many women professionals, the silent perception is that they cannot parallel men when it comes to being a developer or expert in any field of information technology.

There are many behaviors regarding the way women are treated which are learned in the academy. One of these behaviors, probably the most illustrative and yet microphysical[15] and subtle, is making women (and

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14 "Girls' Video Gaming Behaviour and Undergraduate Degree Selection: A Secondary Data Analysis Approach", University of Surrey's, 2019. https://www.sciencedirect.com/science/article/pii/S0747563218304862

15 We use the term micro-physics as used by philosopher Michel Foucault (1926-1984) to analyze the "small powers" that are part of daily life. Power micro-physics refers to the trivial, the imperceptible, that which is barely evident in power relations.

men) believe that Informatics is not for them and that they should not be there in the first place. So, what happens with women who are working in the information technology industry? How can we prevent women who work in the field of technology production from leaving the industry? What is the situation like for women professionals who had to face additional obstacles throughout their course of studies due to their gender and now have to face a work environment that reproduces the same obstacles? These questions are crucial when discussing access to ICTs.

Women in the information technology industry

As mentioned earlier, today most part of the academia is not ready to create spaces that will ensure the equal and professional treatment of women. Yet, it is worth observing that there have been initiatives undertaken by the National University of La Plata (UNLP)[16], involving studies on women's situation in the IT field designed to support them in said institution. On its part, the National Technological University (UTN) implemented in 2018 an institutional action protocol to prevent discrimination and gender violence.[17]

The many stories told by women about leaving their jobs in the field of ICT production owing to the constant unequal and unprofessional treatment they receive is another noticeable aspect of the industry. Companies in the field of technology production are generally reputed as being modern, avant-garde and for hiring employees with a high level of education and/or expertise. Therefore, it is noticeable that discriminatory practices based on gender and reminiscent of old models of discrimination appear so frequently in one of the most creative and innovative productive areas. In this sense, an academic essay on masculinity in the software industry[18] in Argentina explains that despite the fact the male representations offered by this productive sector disrupt

16 For example, the total number of female students is low but not as low as suggested by the statistics produced at a national level by Fundación Sadosky. For more information, see report "Situación de las mujeres en carreras de grado de la UNLP relacionadas con STEM" done by the National University of La Plata. http://cleilaclo2018.mackenzie.br/docs/LAWCC/188343.pdf STEM is an acronym which refers to the areas of knowledge where female scientists and engineers often work, such as science, technology, engineering and mathematics.
17 "Protocolo de acción institucional para la prevención e intervención ante situaciones de violencia o discriminación de género u orientación sexual" – June 2018, National Technological University (UTN)
https://www.frd.utn.edu.ar/sites/default/files/NoticiasHome/Ord.1638.%20Protocoloprevenciondelaviolenciadegenero.pdf
18 Palermo Hernán M. (2018). "Masculinidades en la industria del software en Argentina" Centre of Labor Studies and Research (CEIL-CONICET-Argentina) https://www.raco.cat/index.php/RIO/article/viewFile/342108/433174

traditional models; ultimately the industry still prefers male developers as it sees them as "crack[19] programmers".

Women's reasons for leaving the industry are varied and include, just to name a few:

- frequent comments suggesting that technology work environments are not "suitable for women" and that they lack the necessary skills;
- underestimation and fierce criticism of their work just because they are women;
- constant one-way flirting on the part of colleagues and managers and sexual harassment;
- sexist comments;
- discrimination regarding promotion opportunities on the grounds of gender, coupled with speculations around potential maternity leave;
- unconscious gender biases;
- pay gap between men and women;
- pressure and stress resulting from having to "show" they have the technical expertise needed for the job;
- daily situations involving microsexism[20] such as mansplaining[21], manterrupting[22], bropropriating[23], and derogatory attitudes towards work, etc.

The above information was gathered through multiple women's stories from a community called Las de Sistemas. Unfortunately, there are not a large number of reports to show the true dimension of the issue.[24] That is, the current situation of women who work in the field of information technology. Even though there are salary statistics (CESSI)[25], these do not really shed light on the nature of women's participation in said area. On top of that, the percentage of women working in the pro-

19 In Argentina, "crack" is used colloquially to refer to a person worthy of admiration who performs a task with great skill.

20 *Microsexism* refers to a broad range of widely accepted interpersonal behaviors that women live with on a daily basis. It also refers to practices approved of by society in contrast with other forms of sexist violence typically reported and condemned. Microsexism is breeding ground for other forms of gender violence.

21 *Mansplaining* refers to those situations in which a man tries to explain something to a woman without regard to the fact that the explainee may know as much as the explainer or may even be an expert in the subject.

22 *Manterrupting* refers to the unnecessary interruption of a woman by a man which prevents the expression of an idea on her part.

23 *Bropripriating* refers to the situation in which a man takes a woman idea (generally at the workplace) and takes credit for it.

24 One of the richest sources when gathering evidence was the report done by Fundación Sadosky Y las mujeres… ¿dónde están?, and the recent report done by Chicas en Tecnología Un potencial con barreras: la participación de las mujeres en el área de ciencia y tecnología en Argentina.

25 CESSI (Chamber of the Argentine Software Industry) publishes on a yearly basis a list of companies that are part of the chamber.

duction of ICTs remains unknown. Yet, it is possible to have a fair idea of the quality of their talent by looking at the figures in the field of Artificial Intelligence (AI) provided by the World Economic Forum (WEF), which help explain gender equality perspectives displayed across technological industries. The WEF examined female representation in AI and found out that there exists a significant gender gap, considering that only 22 per cent of professionals in AI worldwide are women, compared to a 78 per cent of men. Based on the report, Argentina is in the twentieth place with 17 per cent of women professionals in AI.[26]

According to an article[27] by Forbes from 2017 the rate of women leaving the ICT industry was at least 45 per cent higher than that of men in the United States. Some of the reasons given include: biases against women, pay gaps, worse working conditions, negative feedback on their work, the brogrammer culture[28] and, finally, maternity leave. Taking into account that the technological environment is more developed in the United States, extrapolating these figures to Argentina could produce more alarming results.

Hence, it is recommended that studies be conducted in order to design policies to retain women in the industry of ICT production. Besides, it is essential that this kind of analyses contemplate provisions regarding transgender and non-binary[29] groups so as to develop a comprehensive approach to the digital gap, considering that these minority groups are discriminated more violently.

The experience shared with Las de Sistemas has allowed us to gather the necessary data to write up this document. From June to December of 2018, ADC has cooperated with this group by conducting informal interviews, making observations and surveys and participating in meetings held by the community and in various events related to the technical field such as NERDEAR.LA and PyConAr. This has allowed ADC to know the issues faced by women in this sector more in depth.

Born in 2017, this community does activist work in order to guarantee the retention of women in the IT industry by accompanying cis[30] women, transgender and non-binary persons in their careers in the field

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26 The Global Gender Gap Report 2018, World Economic Forum https://www.weforum.org/reports/the-global-gender-gap-report-2018
27 "Why Women Leave the Tech Industry at a 45% Higher Rate Than Men", Forbes 2017 https://www.forbes.com/sites/quora/2017/02/28/why-women-leave-the-tech-industry-at-a-45-higher-rate-than-men/#4664ef4c4216
28 The brogrammer culture is based on the stereotype of the male programmers and their mutual understanding at the workplace.
29 Non-binary refers to gender identities that are outside the binary gender classification (masculine and feminine).
30 "Cis" refers to individuals whose gender identity coincides with their biological sex. Transgender is the opposite for cisgender.

of technology development. A promising women's movement is growing in Argentina which aims to expand women's participation in the IT industry. However, there was the need for a community of professionals (that is to say, people "already working") to make visible the issues faced by women who work in this field. Now, the LasDeSistemas community has more than 400 members and close to 7 thousand followers on Twitter.

The #nosPasaALasDeSistemas hashtag[31] allowed bringing to the fore multiple stories and daily workplace situations experienced by female professionals in IT. Hashtags have easily shown that these experiences are not isolated cases but a reflection of the systematic violence towards women in this sector. This systematic nature of violence is often downplayed and discredited by most IT workers, which is shown by the replies elicited by the tweets and hashtags used. Many women in the industry not only complain about the lack of trust in their opinion but also about discrimination at the workplace and gender violence in the digital and analog spheres.

It is worth adding that the hashtag also showed the support and solidarity that exist among women in this industry.

For this reason, we believe it is important to raise awareness about the existence of this kind of situations and testimonies so that women and transgender people can identify and label the violence they may be subject to. Basically, it is essential for them to know that inequality at the workplace (or anywhere else) is not their fault nor has to do with their being "troublesome". Identifying systematic practices not only helps to make something visible but also to understand that it is necessary to uproot a culture of violence and discrimination based on gender.

These stories are but a small sample of experiences of those women who have survived in this kind of environment. They offer cruel evidence of the situations faced by women who work in this field and should not be treated as a catalogue of experiences faced by "brave" women who have been able to attain a position in the labor market despite the difficulties. And of course, brave they are.

It is alarming that there are more events where these stories are used as a way of showing commitment with women's situation in the field of technology. However, finding stories like these means said commitment has failed. As one feminist saying goes "we want to be free, not brave".

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31 See tweets in https://twitter.com/search?q=nospasaalasdesistemas&src=typd

If companies and governments undertake to eliminate gender inequality for once and for all, it won't be necessary to make use of these stories again.

What do we mean by cyber security? What does it have to do with women?

There are various definitions for the concept of cyber security and, so far, no consensus has been reached. In Argentina, for example, there is no definition unanimously adopted by state agencies[32]. On the other hand, progress towards a definition has been made across multiple international levels. Yet, the concept is being permanently developed and discussed, which shows that there are opposing viewpoints and interests behind the concept.

Regardless, broadly speaking, cyber security refers to three different aspects:

1. Cyber security as the protection or defense of an organization's infrastructure (public or private), their networks, data and users:
2. The work performed by security forces on investigation, prevention and action against crimes in the digital field (cybercrime);
3. Surveillance activities conducted by intelligence agencies.

Also, we consider that "cyber security and women" may be approached from different perspectives depending on the actor using the term. Corporations, states, civil society and independent users will not take the same approach.

For instance, corporations and states tend to consider that the problem is due to a "lack of women" and that the only viable solution is to "train and develop" them so that they can enter the field. Some companies resort to the metaphor of the "crystal ceiling"[33] to explain the issue. Finally, there are some initiatives which attribute the problem to the lack of visible viable models and training and for which they recommend resorting to coaching programs led by female mentors.

It is important to note that the lack of women in cyber security coupled with the low number of women in management positions is directly linked with a work culture that has brewed for years at university and in other educational fields. This eventually reverberates in the industry.

32 ADC's report "Cyber security in the mass surveillance age" https://adcdigital.org.ar/wp-content/uploads/2016/09/Cybersecurity-Argentina-ADC.pdf
33 Crystal ceiling refers to the barriers to promotion facing women in the companies where they work, which prevent them from reaching the top positions.

In addition, it should be mentioned that there are some women from IT who take it upon themselves to carry out actions such as events, presentations and training courses in companies to make inequality at the workplace visible. However, companies fail to bring about institutional changes in their organizations. This is the reason why some of them are known for purplewashing, that is, for showing that they care for women's rights when, in fact, they do not necessarily undertake actions to address gender inequality.

The absence of a legal framework that specifically addresses gender inequality at the workplace brings about various consequences, the main one being that the State paves the way for the market to adopt solutions that seem egalitarian at face value but which later prove to reproduce old gender mandates in new ways. For example, Facebook and Apple are implementing cryopreservation and egg storage initiatives in other countries to delay their employees' maternity[34]. In Argentina, this procedure will be replicated by at least one technology firm.[35]

Work culture in the IT field that is not inclusive of women would not be so effective were it not fostered by the private sector. Nowadays, companies are unable to design neither internal policies to eradicate gender discrimination and harassment nor policies to change the unfair way of allocating tasks between men and women. After all, this is difficult to achieve when the current legislation supports the unequal partitioning of tasks based on gender. The most visible manifestation of inequality (and, why not, the most outrageous one) is that of maternity and paternity leaves. In Argentina, maternity leave is granted for 90 days, while paternity leave is granted for 2 days,[36] based on the assumption that mothers are solely responsible for taking care of children's needs. Thus, women end up being more expensive hires than men. This situation is worsened by the fact that women spend time off work intermittently or unemployed as they must juggle with care and reproduction work needed by other dependents in the family (in other words, unpaid domestic work), which is typically attributed to women. This unequal task distribution between men and women has an impact on their work shifts (women must spend more hours doing the housework). According to a report published by the organization Economía Femini(s)ta, which uses analyzed data provided by the Encuesta Permanente de los Hogares

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34 "Apple and Facebook offer to freeze eggs for female employees" The Guardian, 2014. https://www.theguardian.com/technology/2014/oct/15/apple-facebook-offer-freeze-female-employees
"No, companies shouldn't pay women to freeze their eggs", Wired 2017. https://www.wired.com/2017/04/no-companies-shouldnt-pay-women-freeze-eggs/
35 "El 'tic tac' biológico ya no apremia", Clarín 2019. https://www.clarin.com/opinion/tic-tac-biologico-apremia_0_O5DqKzEYr.html
36 https://www.argentina.gob.ar/trabajo/buscastrabajo/licencias

[Permanent Household Survey], 75 per cent of these tasks were performed by women in Argentina in 2018.[37]

On the other hand, the pay gap is another problem commonly found in the professional field and in the country in general. Based on figures released by INDEC, depending on their employment situation, type of occupation and income, women's average earnings are 74 per cent of men's average earnings. Regarding highly skilled jobs, a woman earns 82 per cent of what a man does and she earns 80 per cent of a man's pay in the case of low-skilled jobs. Gender pay gaps are narrower when it comes to tasks requiring higher skills or expertise, but wider in the case of non-qualified jobs, where women make almost 65 per cent of what their male counterparts earn.[38]

Cyber security and activism

Civil society organizations, states, corporations and independent internet users are exposed to cyber security incidents and attacks and may become victims (or even "victimizers") of malware, data leaks, surveillance and privacy violation. Regardless, it must be said that in some countries governments and companies pose a serious threat to the activities carried out by human rights advocates, whose online[39] activities are surveilled as a result of their offline acts. In the global south[40] there are different scenarios when it comes to the commitment to security, the extent of which varies depending on the context; nonetheless, scarce efforts have been undertaken even at a global scale. For example, most part of the legislation on cyber security and cybercrimes tends to focus only on surveillance and monitoring of internet activity but fails

37 "La desigualdad de género se puede medir Datos de la Encuesta Permanente de Hogares. 3er trimestre de 2018" Economía Feminista, February, 2019.
https://rpubs.com/natsumi_shokida/tercer_trim_2018
http://economiafeminita.com/la-desigualdad-de-genero-se-puede-medir-3/
38 Mujeres y mercado de trabajo, a report published by Instituto Nacional de las Mujeres [National Institute of Women] https://www.argentina.gob.ar/sites/default/files/informe-mujeres-mercado-trabajo.pdf
"La brecha salarial entre hombres y mujeres, un problema que persiste en el mercado laboral", Unión Informática, July, 2017. https://unioninformatica.org/la-brecha-salarial-entre-hombres-y-mujeres-un-problema-que-persiste-en-el-mercado-laboral/
39 As an example, we may cite the case of illegal espionage of activities in Mexico using Pegasus software, owned by the company NSO Group https://www.nytimes.com/es/2017/06/19/mexico-pegasus-nso-group-espionaje/
40 Cyber security in the global south, Privacy International 2017 https://privacyinternational.org/sites/default/files/2017-09/Cybersecurity_2017.pdf

No Presten Atención al Hombre Detrás de la Cortina: Exponiendo y Desafiando a los Gobiernos que Recurren al Hackeo para Fines de Vigilancia, Privacy International, 2018 https://privacyinternational.org/advocacy-briefing/2076/no-presten-atencion-al-hombre-detras-de-la-cortina-exponiendo-y-desafiando

to address the security of systems, in particular of those related to critical infrastructures.

Argentina is experiencing alarming situations that need to be attended to, such as: proposals to confer more surveillance state's power; the implementation of policies designed to control populations using biometrics; the lack of clear cyber security strategies, just to name a few. Even though some countries of the Global South are experiencing worse situations, Argentina may also have to face similar scenarios in the future.

Regarding women's digital security, it is necessary to examine the aftermath of the demonstration that took place on March 8, 2017. When the demonstration was over, a group of unidentified police officers arrested journalists and women who were taking pictures with their cell phones. The phones were seized and some women were reportedly obliged to unblock them.[41]

Hacktivism is a form of defending human rights that is progressively addressing women's particular situation.

Female advocates of human rights face specific risks regarding surveillance and the vulnerability of information security which could jeopardize their devices, data and even their own bodies. However, ICTs are a central tool that can be used to report these and other rights violations. Hence, these technologies must afford safety[42], by, for example, applying privacy principles by default and design. One of the approaches to "cyber security and women" has to do with the threats to and the vulnerabilities and risks of female activists and human rights advocates. In this context, numerous organizations[43] are working towards improving the digital security of female human rights advocates and security seen in a holistic way[44]. Therefore, it is necessary to design tools that protect information systems and devices and to pass legislation that will not penalize the use of encryption, anonymity and pseudonyms.

Besides, there are organizations who wish to replace the term cyber security with "digital security" in order to avoid references to the military

41 "Un descontrol policial para cazar mujeres" Página 12, 2017 https://www.pagina12.com.ar/24859-un-descontrol-policial-para-cazar-mujeres
"Paro de mujeres: Cómo fue la razzia policial" Cosecha Roja, 2017 http://cosecharoja.org/paro-de-mujeres-como-fue-la-razzia-policial/
42 Ron Deibert, Towards a cyber security strategy for civil society, in Alan Finlay (ed.) Global Information Society Watch " Internet rights and democratization", APC & HIVOS, https://www.giswatch.org/en/freedom-expression/towards-cyber-security-strategy-global-civil-society
43 https://ciberseguras.org/nosotras/
44 "Security in a box – digital security tools and tactics" https://securityinabox.org/es/
"Zen y el arte de que la tecnología trabaje para ti" https://gendersec.tacticaltech.org/wiki/index.php/Complete_manual/es

and have more to do with the protection of citizenship, people and their communities.[45]

It is also essential to address violence against women both in online and offline environments through comprehensive initiatives designed by governments. For this reason, cyber security strategies should involve provisions regarding gender, whereas legislation imposing restrictions on anonymity and/or encryption in online communications should be avoided. These measures are needed in view of the fact that many of the claims filed by journalists and women regarding domestic and/or work violence are made public anonymously.

Regarding policies implemented by states, along the lines of securitization, it must be borne in mind that it is essential for these policies to be supported with evidence. Besides, they must be backed by their respective necessity and proportionality tests in order to avoid potential damage to people's rights. We must point out that digital security policies should focus on the individual and be developed in accordance with human rights laws enshrined in regional and international agreements. Finally, the public policies so designed should be applied making sure that personal data is effectively protected.[46]

Work culture in the ICT production industry

According to data provided by Women's Society of Cyberjutsu (WSC)[47], women constitute just 11 per cent of the cyber security workforce. Taking into account that, according to Cisco, millions of job positions will be required in cyber security, it is evident that these estimates must be considered. The cyber security workforce gap is a phenomenon that companies and organizations have been analyzing.[48] However, we will present our viewpoint based on the experience of women who are working in the IT industry in Argentina.

- The approach and stereotype problem

In university careers there is little awareness of jobs and areas related to cyber security. This influences people's decisions when having to

45 https://adcdigital.org.ar/2016/04/06/oea-declaracion-sociedad-civil-latinoamericana-seguridad-digital/

46 Ibid.

47 Women's Society of Cyberjutsu is a non-profit community focused on raising awareness about professional opportunities in cyber security and the progress made by women in this field in terms of narrowing the gender gap and the general workforce gap in information security jobs.

48 "The Cyber security Workforce Gap" Center for Strategic and International Studies https://www.csis.org/analysis/cybersecurity-workforce-gap

choose a work area within IT. In other words, many female students believe that the skills needed to work in cyber security are incompatible with those learned at university. They also are under the impression that all students require special abilities and inaccessible skills which they lack.

Frequently, it is believed that women in the IT industry are naturally apt for functional analyst roles. Functional analysts are responsible for being the liaison between users and a company's IT area and for analyzing clients' businesses and processes in order to understand and fulfill their needs.[49] Hence, it may be concluded that the role assigned to them in this industry sector is, in a way, different from the role assigned to programmers and cyber security experts, who are responsible for making important technical decisions. In fact, according to many women professionals, people in this field do not often associate women with job positions in cyber security. And, if they discover there are women occupying these roles, this comes as a surprise.

On the other hand, cyber security tends to be associated with the military and is therefore associated with masculinity, which leaves behind women professionals who may be interested in it. Besides, there is the ongoing prejudice that women's sensitivity would prevent them from performing successfully in this kind of roles. There are already a low number of women working in IT, yet the field of cyber security is considered to be practically vacant in terms of the percentage of women working in this particular area.

Last but not least, there are stereotypes of male cyber security experts, in particular for hackers. These stereotypes jeopardize the existence of new models and representations for women due to the fact that the ones currently in place associate hackers with isolated and unsociable men.

- Acknowledgement

The underrepresentation of women in the area of cyber security and the lack of reference models negatively affects women who wish to pursue a career in cyber security[50]. On top of that, the ones who work in this field face great hardship due to the way their peers and superiors value their work. Women professionals are often under pressure as they feel they have to show they are apt for the task. In other cases, some women do not even dare apply for this type of positions even though they have

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49 https://www.cessi.org.ar/perfilesit/detalle-de-analista-funcional-4

50 It is important to highlight the organization of pioneering events such as NotPinkCon in Argentina. Its goal is to encourage more women to participate as speakers in information security events and also to promote women's interest in this field. https://notpinkcon.org

the necessary skills. On the other hand, those already working in the field undergo extra pressure leading to an unnecessary level of stress. Working with the constant feeling that their professional work is undervalued is a stress factor in itself. It is quite common for some women to pursue other career opportunities within the industry. The drop-out rate is a serious problem that is not being contemplated by inclusive policies in the IT industry, let alone in cyber security.

- Hiring

Job offers are typically designed for male candidates. Job ads and opportunities in cyber security are created in such a way that women do not see themselves doing these jobs.
Many other women tell stories that make the matter still less clear-cut. They point out that there are some companies which are indeed interested in promoting diversity among teams. However, these companies completely fail to guarantee an equitable workplace. It is worth highlighting that these environments are made up of an overwhelming male majority and the work culture of such organizations is determined by standards complicit with men. This form of comradeship is based on masculinity patterns that result in workplaces that are too overwhelming for other genders.

Maternity and paternity leaves represent another critical aspect for consideration. Many women professionals claim that in job interviews it is women and not men who get asked questions about children. There are other situations worth analyzing too.

The first one has to do with employment history. Women with children have employment "gaps" or time periods in which they remained unemployed. This factor reduces their chances of being hired for certain jobs and it also adversely affects pay bargaining discussions. The situation is particularly more difficult for those women who have two or more children.

Secondly, regarding the above, men who have children do not have "gaps" in their employment history, even if they have two or more children, which means they have higher chances of being hired compared to their female counterparts.

The third aspect concerns women's returning to work after their maternity leave or reinstatement after time off work due to a sick child. Said reinstatement may result in unfair treatment or raise suspicions among employees as to the time-off period granted to them.

Finally, the above factors co-exist with the marked pay gap between women and men in relation to the same job positions.
Final word and suggestions

Marie Gaup Moe is a scientist and researcher at SINTEF, one of the largest independent research organizations in Europe. She holds a PhD in information security and a varied resume. She has experience as team leader at NorCERT, the Norwegian National CERT (Computer Emergency Response Team). Throughout her university career she encountered the obstacles typically faced by students of mathematics and cryptanalysis. Gaup Moe does not mention any type of difficulties not directly related with the complexity of the subject of study.

Gaup Moe comments that the two most important highlights of her academic experience were interacting with a community devoted to the study of cyber security and being able to clear out her doubts in class and other learning environments. This is not a minor thing; it reflects that this kind of spaces may be comfortably inhabited by women.

There are some reasons we can cite to try and explain the high number of drop-outs in Informatics courses of studies from 1970 onwards in Argentina. For one thing, there are not any communities providing support to female students, and, on the other hand, institutions fail to include women in those spaces. Even today, there is some sort of institutional scheme in place that causes women to be treated as outsiders.

On the other hand, we must recognize that Norway, among other Nordic countries, is in the vanguard when it comes to narrowing the gender gap. According to data provided by the Organization for Economic Co-operation and Development (OECD), almost three out of four women form part of the paid workforce. Besides, political leaders show great commitment –there are plenty of women in decision-making positions– towards promoting gender equality at the workplace as well as in the public sphere and at home. Apart from being necessary for a more equal society, this kind of policies has also contributed to the increase in economic growth in the last 50 years.[51]

Some of the reasons that help explain the almost equal gender distribution among workers are, undoubtedly, policies promoting the care of children and those which foster the equitable division of household work. This is made possible by large subsidies and work leaves which allow both parents to take time off work after childbirth.

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51 "Is the last mile the longest? Economic gains from Gender Equality in Nordic Countries", 2018 Organisation for Economic Co-operation and Development (OECD).
https://www.oecd.org/els/emp/last-mile-longest-gender-nordic-countries-brief.pdf

A recent academic paper explores and measures the "wage penalty"[52] for women who are mothers. It involves women who decide to choose jobs with shorter work shifts or with lower wages but more compatible with the care of young children. The study involves six countries and there is plenty of difference between them. For example, in Germany, after giving birth, female workers earn 61 per cent less, while in Sweden and Denmark they earn 27 and 21 per cent less, respectively. It is worth highlighting that men's wages were not greatly affected by paternity in any of the countries involved.

Evidently, Argentina is not as economically developed as Norway. For this reason, any comparison with a country of such characteristics would be unfair to begin with. Still, these models of society are illustrative of the type of society we aspire to as a country, if only as a long-term goal.

The Nordic model offers some hints our country can take in order to guarantee the participation of women in the technological field (especially in the area of cyber security) and also to promote local development. One only needs to look at the way in which women's inclusion in the workforce in Scandinavian countries has made it possible, among other achievements, to stimulate a great economic growth.

Taking into account that the software industry is one of the most booming productive sectors in Argentina, how can we promote the inclusion and stability of professionals in the software industry so as to expand our economy and use women's talent to everyone's advantage? Here are some ideas:

• Developing school programs aimed at girls and adolescents that will debunk myths around science and mathematics university courses;
• supporting programs that will encourage communities of women to carry out activities in universities;
• promoting bursaries for female university students;
• offering incentives to technology companies for them to design gender protocols and best practice guides in order to eradicate women's desertion from those fields[53];
• Improving maternity, paternity and compassionate leaves as a way to

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52 Wage penalty is a penalty for maternity and it can be defined as the percentage by which women's wages have decreased compared to the wages paid one year prior to childbirth. The article "Child Penalties Across Countries: Evidence and Explanations" is available in: https://www.nber.org/papers/w25524
- "How big is the wage penalty for mothers?" The Economist 2019. https://www.economist.com/graphic-detail/2019/01/28/how-big-is-the-wage-penalty-for-mothers
53 There are some companies already working on gender protocols https://www.iprofesional.com/management/286212-mujeres-protocolo-recursos-humanos-Las-empresas-empiezan-a-tomar-medidas-contra-la-violencia-de-genero

promote co-responsibility and a more equitable distribution of family care work. State policies that foster a balance between formal employment and household work make it possible to promote an equal division of household work, reduce gender inequality, increase the number of job opportunities, reduce poverty and stimulate development.

After all, according to The Global Gender Gap, a report done by the World Economic Forum[54] in 2018, although there is marked inequality regarding the pay of men and women in Argentina, our country is ahead of other great economies in Latin America and the Caribbean in terms of gender equality. By joining efforts, not only can we keep on advancing towards a more developed country with more gender equality, but we can also unlock the full potential of half of Argentina's talents.

54 The Global Gender Gap Report 2018, World Economic Forum
https://www.weforum.org/reports/the-global-gender-gap-report-2018