

WOMEN IN ENGINEERING AND SCIENCE INITIATIVE: RAISING AWARENESS AND MONITORING GENDER EQUITY

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Abstract

The commitment of the international community to achieve sustainable development is currently based on the 17 SDGs of the UN, being the SG #5 where the importance of reducing gender inequality is explicitly recognized. For institutions involved in Continuing Education, it is therefore a priority to develop initiatives that strengthen the participation and empowerment of women in different fields, especially in the areas of science, technology, engineering and mathematics; STEM. The fulfillment of this goal in Latin America is especially complex because its two greatest social challenges are gender inequality and exclusion. In this sense, the OECD Latin America Policy Priorities Report identifies that there are only 3 women for every 10 men in STEM-related jobs.

Given the need to provide the ideal conditions to raise the level of women participation and recognition, our institution launched at the beginning of 2019 a proposal to increase the presence and participation of women in STEM. The result is the Women in Engineering and Science (MIC) initiative, which seeks to raise awareness and monitor gender equity, equal opportunities for women and recognition of their work in the operation of the School of Engineering and Sciences.

This work in progress presents the work objectives for a particular committee within the MIC initiative: Linkage Committee. This committee is responsible for internal linkage within the institution and external linkage with national and international organizations, companies and universities. This work also analyzes the strategies designed to meet the proposed objectives, including: (i) to create an ecosystem that promotes women empowerment in the School of Engineering and Science to achieve international projects with a gender and social responsibility perspective, and (ii) to implement Lean In Circles; groups of women who meet regularly to learn and grow together.

Keywords: women in engineering, STEM, inclusion and diversity, gender gap

1 INTRODUCTION

The development and deployment of female human capital is a critical element of global economic growth. As successive generations of educated women enter the workforce, economies can only fully utilize their talent if there is a corresponding reduction in the gender economic gap. The World Economic Forum report "The Future of Jobs" warns about the fact that gender parity is one of the main trends driving growth in industries that include Architecture & Engineering, and Manufacturing & Production [1]. The technology industry, which has enjoyed tremendous growth and is often perceived as prospective, is also home to significant gender imbalances: Industries could benefit from a better gender balance among employees, including among the main leaders.

As the Fourth Industrial Revolution takes hold, it will affect workers in different ways. Proper preparation to adapt to related disruptive changes will include addressing gender gaps, which in turn could unlock new growth opportunities for businesses. Many studies have highlighted the statistically significant relationship between companies that have women in their upper ranks and companies with positive financial performance. In general, women's greater commitment fosters greater credibility for institutions and more active participation in public life, as noted by the OECD, Organization for Economic Cooperation and Development in its 2014 analysis [2].

Companies can commit to related actions, incorporate best practices and expand solid initiatives in several ways: as described in the 2017 World Economic Forum report, *Accelerating gender parity: a toolkit*, high-level acceptance can be obtained by clearly communicating the justification of gender parity, understanding its specific gender gaps, recognizing the bias and setting goals to monitor change [3].

The study realized by McKinsey & Company *Women in the Workplace 2019*, shows that it has been a progress in women's representation in leadership positions, especially in C-Suite, but there is still an important gender parity gap reduction opportunity during the first steps of the pathway to become a manager [4]. While improving practices in the workplace may require a significant short-term effort, the subsequent long-term expansion of opportunities for women can transform the company's performance. This is particularly critical now, in light of the technological developments associated with the Fourth Industrial Revolution that are affecting companies.

The present study, Work in Progress, presents the foundations and goals of the (MIC - Mujeres en Ingeniería y Ciencias) initiative: maintaining diversity in the School of Engineering and Science of Tecnológico de Monterrey, promoting related innovation and managing change in all activities and STEM (Science, Technology, Engineering and Mathematics) related programs .

2 METHODOLOGY

The national School of Engineering and Sciences is the most populated school at Tecnológico de Monterrey in terms of faculty and students. The school has 2148 professors nationwide from which 33% are full-time faculty and 67% adjunct faculty. As shown in Fig. 1, the percentage of female faculty at the National School of Engineering and Sciences is 29.9% for full-time and 31% for adjunct. The total faculty female percentage corresponds to 38.9%, indicating that the percentage for the School of Engineering and Sciences is considerable lower. This ratio also varies per region within the school going as low as 24% at Mexico City up to 34% at the northern region, as indicated in Fig. 2. Women are clearly underrepresented. Therefore, the need of defining a strategy towards a more diverse workforce with an inclusive culture where minorities can have equal opportunities to grow and advance.

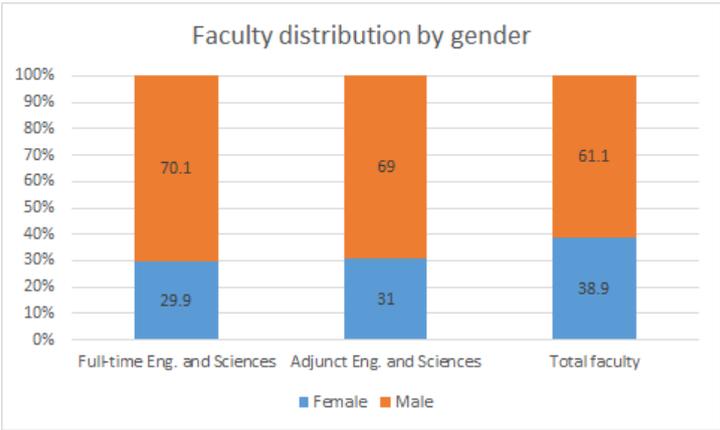


Fig. 1 Faculty distribution by gender at Tecnológico de Monterrey (2020) [5].

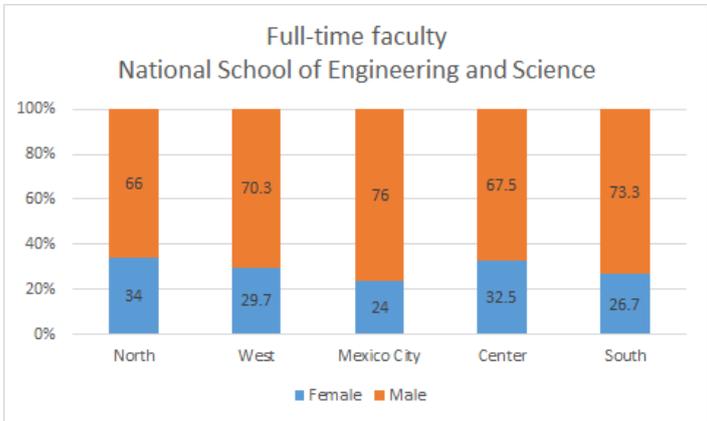


Fig. 2 National School of Engineering and Science full-time faculty distribution by gender and region (2020)

The Women in Engineering and Science (MIC - Mujeres en Ingeniería y Ciencias) initiative at Tecnológico de Monterrey seeks to raise awareness and monitor gender equity, equal opportunities for women and recognition of their work in the operation of the School of Engineering and Science. This effort is nationwide with representatives at the different campuses in all the 5 regions of Mexico: north, center, south, west, and Mexico city. Professors, researchers, directors, deans, employees, and students integrate the founding committee of the initiative. This committee has defined five main committees to focus on, as shown in Table 1.

Table 1. Five committees of the MIC initiative

Committee	Main Objective
Rector	Women empowerment within the School of Engineering and Science: strengthening of women competencies and presence, individually and as a group, to participate equally in the decision-making processes, be recognized and have equal access to resources.
Mentoring	Mentoring for professors, researchers, employees, students and potential students of the School of Engineering and Science.
Linkage	Map the ecosystem of efforts seeking women empowerment to sum and work together. Internal: professors, students groups, institution External: companies, organizations, and other universities
Promoter	Communicate the different strategies, recognize role models, organize events to attract new talent and promote networking, branding and showcasing of successful women in science and engineering.
She-STEM Research	Foster research focused on gender equity and social responsibility

Each of the five committees has a detailed action plan for the year with defined goals towards the objectives of each group. There is also a group of professors working at each committee to achieve these actions. In general, the main objective of this first year (August 2019 - July 2020) is to investigate the state of the art and learn about the best practices in order to define our own processes and standards to pave the way for the specific projects at our university. The official launch event took place at Monterrey on August 2019 and was live streamed to all the campuses. The national dean of the School of Engineering and Science signed a commitment to support the MIC initiative and participate actively to achieve its goals. Simultaneously, the dean of each region signed the agreement as a symbol of a nationwide commitment.

Concerning the Linkage Committee, there are two main strategies defined for this first year: (i) to create an ecosystem that promotes women empowerment in the School of Engineering and Science to achieve international projects with a gender and social responsibility perspective, and (ii) to implement Lean In Circles. The first strategy would map the different efforts, both internally and externally, towards women empowerment at different instances such as students' groups, companies, organizations and other universities. This would allow MIC identify best practices as well as strategic links for potential collaboration on future projects. Use as many sections and subsections as you need (e.g. Introduction, Methodology, Results, Conclusions, etc.) and end the paper with the list of references.

2.1 Women empowerment ecosystem

This strategy looks forward to mapping an ecosystem of all the different efforts related to women empowerment. It is well known that women are underrepresented at different sectors and that there are different groups and organizations working to improve this situation. However, many times these efforts are isolated even though they have a common goal. For this reason, the MIC initiative considers it is relevant to identify these endeavors, learn from previous work and recognize best practices to adopt in future projects. Once this ecosystem is mapped, including relevant actors at the different regions of our country, it would be easier to organize and define partnerships towards specific goals.

2.1.1 Internal ecosystem (within Tecnológico de Monterrey)

The first challenge was to identify the different groups and associations at Tecnológico de Monterrey that have previous experience working towards gender equity. Across the country, there are several student groups that despite having a common objective, rarely work together. Each student group as a leading group that guides and works for the association during a year. After this period, a new group leads the team. This rotation is healthy for the group to have people with fresh ideas and energy to work according to the defined action plan. The downside is that a year goes by fast and the group needs to look for new members so that they can keep working on the defined goals. Once students advance on their study programs, they start working or go abroad for exchange programs, and have less time for these initiatives. For this reason, freshmen are always a good addition to the group. Table 2 shows a list of pro-women student groups available at Tecnológico de Monterrey. Some of them are student chapters or global organizations.

Table 2 also includes two institutional efforts at Tecnológico de Monterrey that work to reduce gender gaps, recognizing the bias and setting goals to monitor change, leading to a more inclusive culture. The first one is called Premio Mujer Tec (Tec Woman Prize) which objective is to recognize female students, alumni, employees, professors or directors in one of the 8 categories: Transforming Power, Citizenship, Art and Culture, Science and Technology, #She4She, Entrepreneurship, Health and Sports, and Work-Life Balance [6]. Since 2013, this prize has recognized outstanding women who are role models that inspire others to keep working and be successful. The second one is an internal organization that was created at Tecnológico de Monterrey during the end of 2017: Centro de Reconocimiento de la Dignidad Humana (Human Dignity Recognition Center) [7]. The main goal of this center is to foster diversity, to lead to a more inclusive culture, and to respect human rights. This center was created by the university to operate independently from the Schools and have representation at all the campuses of the country.

Table 2. Internal Ecosystem

Student Group/ Internal Organization	Campus	Social Networks
Women in Tech (WIT)	Monterrey	https://www.facebook.com/womenintechmx/
He for She	Monterrey	https://www.facebook.com/HeForSheTec/
Girl UP Tec de Monterrey	Monterrey	https://www.facebook.com/girlupmonterrey/
Women in Science and Engineering (WISE)	Monterrey	https://www.facebook.com/wise.itesmy/
WIE Women in Engineering - Student Chapter IEEE	Monterrey	https://www.facebook.com/IEEEWIEMTY/
FOCUS	Sonora Norte	https://www.facebook.com/grupofocuscn/
STEM	Sonora Norte	
Premio Mujer Tec (Tec Women Prize)	All	https://mujertec.mx/ https://www.facebook.com/MujerTecMty/
Centro de Reconocimiento de la Dignidad Humana	All	

2.1.2 External ecosystem (outside Tecnológico de Monterrey)

There are many companies, universities and organizations worldwide working to support women and create an environment that enables them to reach their full potential. An initial research shows well established associations with a remarkable trajectory and experience on the topic. Table 3 shows an initial mapping of companies, universities and independent organizations that have been identified as future role models and potential partners for MIC. The companies included have an important presence in Mexico and are already collaborating with Tecnológico de Monterrey.

Table 3. External Ecosystem

	Women's network	City/ Country	Web page
Company			
Frisa	Women@FrisaAerospace; Women@Frisa	Monterrey/ México	
Nemak	WIN Women in Nemak	Monterrey/ México	
General Electric	GEWN GE Women's Network	Global	https://jobs.gecareers.com/global/en/womens-network
Schneider Electric	Ambassador PINK Engineering	Global	
Whirlpool	Mujeres Whirlpool	Global	https://www.whirlpoolcorp.com/whirlpool-mexico/
Jhonson Controls	Next Chapter	Global	https://www.johnsoncontrols.com/es_mx/careers/why-johnson-controls
John Deere	WomenREACH	Global	
Ford Motor Company	Women in Manufacturing	Global	
University			
MIT		Cambridge/ USA	https://studentlife.mit.edu/impact-opportunities/diversity-inclusion/womenmit
Harvard University	Harvard Graduate Women in Science and Engineering (HGWISE)	Cambridge/ USA	https://projects.iq.harvard.edu/hgwise/mentoring-program
Stanford University	VMware Women's Leadership Innovation Lab	California/ USA	https://womensleadership.stanford.edu/
University of Oxford	Women in Physics Mentoring Programme	Oxford/ UK	https://www2.physics.ox.ac.uk/equality-and-diversity/women-in-physics-society/mentoring-0
Yale University	Women in Science at Yale	Connecticut/ USA	https://wisay.sites.yale.edu/mentoring
Columbia	Columbia College Women Mentoring	Carolina/ USA	https://www.college.columbia.edu/alumni/mentoring/ccw
Organization			
IEEE WIE	Women in Engineering	Global	https://wie.ieee.org/
	He for She	Global	https://www.heforshe.org/en
ONU	Mujeres Mexico	CDMX/México	http://mexico.unwomen.org/es
WIT	Women in Technology	USA	https://www.womenintechnology.org/
	Lean in	USA	https://leanin.org/
SWE	Society of Women Engineers	USA	https://swe.org/
	ANSPAC	Monterrey/ México	http://www.anspac.org.mx/anspac-para-mujeres/
	Amexme	México	http://www.amexme.org/
	Red de Mujeres Empresarias (Business Women's Network)	México	http://www.reddemujeresempresarias.com/quienes-somos/
	Mujeres Líderes en STEAM Asociación Mexicana de Mujeres Jefas de Empresa (Mexican Association of Women Entrepreneurs)	México Culiacán and Hermosillo /México	https://www.usmxleadersnet.org/programas/1/mujeres-lideres-en-steam
	Global Woman Summit	Global	https://www.globalwomansummit.com/home25794403

2.2 Lean In Circles

Sheryl Sandberg inspires women across the globe with her book “Lean In: Women, Work and the Will to Lead”. She explains how women and men act differently in the workplace and invite women to “sit at the table” and be protagonist of their careers and pursue their goals [8]. Following the success of the book, the Lean In organization was created to support women to reach their full potential and work towards creating an equal world. One of the tools of this organization are Lean In Circles which are groups of women who meet regularly to learn and grow together [9]. MIC plans to adopt and implement Lean In Circles both in person with regular meetings at the main campuses and virtually via zoom platform (www.zoom.us) to create community and support campuses with fewer women.

3 DIRECTIONS IN FUTURE RESEARCH AND CONCLUSIONS

Preliminary results show that there are several efforts worldwide working towards women empowerment and reducing the gender gap. Many companies, universities and independent organizations are involved. Some of them are quite experienced in the topic and have long trajectories with well-defined networking and mentoring programs. One of the challenges is to learn from these models, understand them and adopt best practices to implement them in our community. Another task is to organize these efforts to collaborate towards the same goal. Once we are more conscious about the situation at each of our campuses and the atmosphere around them, we should define strategic partnerships, specific goals, and an action plan to work together.

It is imperative to reduce gender inequality and create an environment where women can reach their full potential. Diversity and inclusion should be in the agenda of every organization, especially where minority groups are more evident. It is our commitment to create awareness about this need and engage the different members of our institution to own the problem and become part of the solution.

REFERENCES

- [1] World Economic Forum. (2016). The future of jobs: Employment, skills and workforce strategy for the fourth industrial revolution. In *Global Challenge Insight Report, World Economic Forum, Geneva*. January 2016.
- [2] Adema, W. (2014). The OECD gender initiative. *Global Social Policy*, 14(1), 123-127.
- [3] WEF (2017) Accelerating Gender Parity: A Toolkit. Accessed on January 2020: <https://www.weforum.org/whitepapers/accelerating-gender-parity-a-toolkit>
- [4] Huang, J; Krivkovich, A; Starikova, I; Yee, L & Zanoschi, D. (2019). Women in the Workplace 2019. McKinsey & Company. Accessed on January 2020: <https://www.mckinsey.com/featured-insights/gender-equality/women-in-the-workplace-2019>
- [5] Casanova, A.M. (2019). Case Study: Breaking Paradigms to Develop Leaders for the 21 st Century. International Finance Corporation - World Bank Group. December 2019.
- [6] Premio Mujer Tec. Accessed on January 2020: <https://mujertec.mx/>
- [7] López, A. “Tec crea Centro de Reconocimiento de la Dignidad Humana”. Tec Review. December 2017. Accessed on January 2020: <http://tecreview.tec.mx/tec-crea-centro-reconocimiento-la-dignidad-humana/?hootPostID=035a4f7618e4b4587ef884c69e7d20ac>
- [8] Sandberg, S. (2013). Lean In: women, work and the will to lead.
- [9] Lean In Circles. Accessed on January 2020: <https://leanin.org/circles>