

WOMEN IN ENGINEERING

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ABOUT THE PROJECT

The purpose of this project was to investigate, identify and assess the barriers confronting women in engineering in order to find ways to redress the underrepresentation of women in the profession. This was completed as a partnership with Engineers Australia and Monash University as part of the Monash Industry Team Initiative (MITI) project.

The Monash Industry Team Initiative (MITI) partners multidisciplinary student teams from Monash University with leading Australian and global industry partners. Student teams from undergraduate, Masters and PhD levels across all faculties collaborate and design innovative solutions to real business challenges for 12 weeks over the summer -miti.monash.edu

In completing this project, many people, both male and female, gave up their time to provide us with their wisdom and experiences, and we wish to sincerely thank them for this. Thank you to Madeleine McManus and Monash University for facilitating this project. We also wish to extend a special thanks to Glenda Graham and Engineers Australia for hosting and supporting us throughout the duration of the project.



ABOUT THE TEAM

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Kim is a final year student studying a double degree of Bachelor of Arts and Bachelor of Science, majoring in Psychology and Physiology. She plans to integrate her studies from psychology and behavioural

studies to pursue a career in Human Resources. She wishes to assist organisations foster a diverse and inclusive work environment that enables employees to achieve their personal career objectives while assisting the organisation achieve their vision and mission.

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Lisa Chen



Lisa is a penultimate year student studying a Bachelor of Engineering and Bachelor of Pharmaceutical Science, majoring in Biotechnology and Formulation Science respectively. She is talented

at collating and interpreting data, and subsequently creating solutions. She is very interested in experiencing research in both industry and academia, hoping to to complete further studies.

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Imogen is a penultimate year student studying a double degree in Chemical Engineering and Pharmaceutical Sciences, majoring in Formulation Science. Imogen is a structured problem solver who likes to extract the

value from data, and also has a keen interest in research. She plans on gaining hands-on engineering experience before completing an MBA.

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Ashlee has just completed a double degree in Mechanical Engineering and Biomedical Sciences. She is a creator who likes to analyse situations to devise and implement strategies to get

high standard and efficient results consistently. Consistently Ashlee has worked in the engagement space, particularly focussing on female engagement as well as on various scholarship of learning and teaching projects.

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INTRODUCTION

Women are contributors to the profession but are still largely under-represented in engineering.

The current engineering workforce consists of 88% of men and 84% of Australian engineering graduates are male (1). Despite gender equality being a well publicised and discussed issue for many decades, very little progress has been made. This contrasts in perceptions of many people who believe that the issue of gender equality in the workforce has already been solved.

Of the few women who do decide to study engineering, even fewer will remain in the profession long enough to reach senior levels. Engineers Australia found that only 51.2% of females who qualified as engineers actually work in the engineering profession (2). As a result, talent and education is being wasted, impeding business growth and productivity.

MEN MAKE UP



OF THE ENGINEERING WORKFORCE

(1)

ONLY

51.2% OF FEMALES QUALIFIED AS ENGINEERS WORK IN THE INDUSTRY There are many benefits to having a gender diverse workforce, not just for the women who are looking to pursue or further a career in engineering. Diverse teams facilitate diverse thought capacity and in general, better solution generation and outcomes (3). Numerous studies have shown that a balanced workforce is strongly associated with good economic performance.

Furthermore, having a diverse workforce reflects the classic Australian ethos of every person's entitlement to a "fair go" despite their gender, age, race, religion, disability or sexual orientation.

This document will outline the reasons for improving gender diversity and inclusion and will provide recommendations on actions that can drive change, in the hope that recruitment and retention of women in the engineering profession can be greatly improved.

THE BUSINESS CASE FOR CHANGE

There is a strong and well documented business case for diversity in the engineering industry. Gender diversity leads to:

- Increased financial performance when a critical mass of 30% female representation is achieved (4). ASX 200 companies with women on boards have been correlated with economic growth and social responsiveness. Companies with two or more women on boards were shown to have to have a higher Return on Equity (ROE) (20.97 vs. 13.63), higher market capitalisations (\$15061M vs. \$4461M), higher levels of revenue (\$8547M vs. \$2077M), and higher net incomes (\$1026M vs. \$266M), compared to companies with no women on their boards (5).
- Better innovation and decision-making. Women in leadership provide a different perspective which leads to diverse problem solving and solutions. An analysis of public U.S. corporations found that female representatives in top management roles showed an increase in innovation intensity, better decision making and better firm performance (3).
- Better customer relations and orientation. Diversity within a company allows customer alignment to adapt to the market and understand the perspective of customers more effectively (6).



Number of Women on Board (5)



THE BUSINESS CASE FOR CHANGE



AUSTRALIA HAS LOST AN ESTIMATED



OF PRODUCTIVITY (8)

- Reduction in staff turnover. Employees are more likely to remain in an organisation that offers a supportive and diverse environment (7). It is estimated that AUD\$3.8 billion of productivity has been lost and AUD\$385 million has been accrued through avoidable recruitment costs due to lack of access to the right talent (8). Additional costs include (9):
 - Advertising, training costs
 - Lost time from interviews, administrative tasks, waiting period for filling the position
 - Loss of customers
 - Low employee morale
 - Termination pay
- Stronger corporate reputation. Diverse and inclusive organisations are positively viewed by the public. The need for becoming the employer and partner of choice is evident as stakeholders recognise top performing organisations that strive for gender diversity and inclusion. The Economist Intelligence Unit reported that 39% of CEOs actively shared their gender equality information in an effort to enhance their public perception (10).
- Attraction of the best talent. Organisations that offer a diverse and inclusive environment will attract the top talent and a wider talent pool of applicants. Across the ASX group's (200, 201-500 and 501+), 48% identified that having a diversity policy assisted in attracting the best talent and 70% noted a benefit from a wider range of skills and background (11).
 - Increased employee satisfaction. Diverse work teams increase employee satisfaction and foster positive attitudes in the workplace. The Fields and Blum study (1997) found that employees working in a team consisting mainly of men showed the lowest job satisfaction compared to mixed gender balanced groups (12).

IT'S TIME C FOR TARGETS

Targets are an effective strategy to create change as they are flexible, can be tailored and monitored dependent on the business' needs.

TYPES OF TARGETS

- Percentage indicators
- Parity or 50/50
- 40:40:20

METHODS OF APPLYING TARGETS

- Candidate lists
- New hires and promotions, including graduates
- Business-wide
- Role specific

Targets set tangible goals which can be worked towards and achieved through strategic policy implementation and actionable items.

Other measures such as Key Performance Indicators (KPIs), goals and objectives can be used to create the same effect.

All targets should include a date of attainment and supporting framework. Similarly, any target on candidacy, promotion or employment should be coupled with appropriate training such that all members of the workplace community know all appointments are based on merit.

HOW TO MAKE PROGRESS



Achieving diversity requires commitment and action from the whole company: the board, employers and employees, as well as society and the entire engineering profession. Steps to improving gender equality can be separated into three key areas: policy, the leaky pipeline, and workplace culture.

> "When women succeed, we all succeed. If you strengthen women in every organisation it strengthens the organisation." Dr. Marguerite Evans-Galea, Executive Director of the Industry Mentoring Network in STEM (IMNIS)

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It is commonly stated in business that "what gets measured gets managed" (13), and this is often the missing step in current company policies on achieving gender diversity. Many companies will "commit to diversity in the workplace", however few will take actionable steps towards achieving this. Without specific goals or targets, little progress can be made. Reporting of progress towards these goals or targets is also key, so that accountability can be held and improvements can be made.

RECOMMENDATIONS

- Actionable items and tasks in policies
- Ensure targets are measurable at every level of the organisation to establish a pipeline of talent
- Make the inclusion and diversity policy public and easily accessible
- Review and publicly report action plans and outcomes annually
- Introduce a preferential partnership system that supports gender diversity
- Aim to become a WGEA employer of choice
- Identify areas of improvement within the business
- Conduct pay remuneration analysis and correct pay gaps
- Pay employees based on their positions, relevant experience and capabilities

THE LEAKY PIPELINE

One of the most important factors to consider in achieving gender diversity is the career pipeline and development of upcoming female engineers, so that there is a pool of highly qualified and competent talent to draw from. That is, developing tomorrow's leaders today.

The first measured point in this pipeline is university, where students who are drawn to the profession are trained to become engineers. Recruitment, development and retention in the workforce follow.



THE LEAKY PIPELINE UNIVERSITY

In Australia, around 84% of domestic entrylevel engineering students are male (1). Additionally, male students are less likely to drop out of engineering courses than their female counterparts.

On average 84% of academics and 93% of university professors are male (14).

This data is not reflective of the average domestic student population, with 60% of students graduating from university being female (15). Furthermore, a larger number of female students are finishing year 12 equivalents and attending university than males.

In a modern society, engineering is a diverse and well rounded profession, however this is not well reflected in the traditional engineering course structures at universities in Australia.

It has been shown that women are far more likely to study engineering if they can see themselves achieving societal good through doing so. A class at MIT in the USA that develops "technologies that improve the lives of people living in poverty" reported that 74% of the 230 students enrolled were female (16).

RECOMMENDATIONS FOR UNIVERSITIES

- Promote engineering's humancentred opportunities to encourage female participation.
- Set targets for female enrolment and graduation.
- Implement female-only scholarships to encourage female participation.
- Run high-school STEM programs to increase awareness and interest of STEM careers for women and squash the preconceived notion that women are not as good at or not fit for STEM subjects/careers.
- Ensure clubs and societies surrounding women in engineering are visible and well organised to include opportunities for networking, mentorship/support and workshops/seminars.
- Celebrate the achievements of women both within the university's engineering faculty, as well as that of alumni.
- Offer female-only fellowships to encourage women into higher-level academic roles.

RECOMMENDATIONS FOR INDUSTRY

- Partner with universities to provide internship opportunities to women.
- Promote women in engineering in the general public space to foster an inclusive community.
- Actively support mentor programs by encouraging employees to mentor university students.

THE LEAKY PIPELINE RECRUITMENT

Attracting top female talent can be a fundamental influence on business success.

A study conducted by Bohnet et. al in 2014 showed that males are more likely than females to be successful in securing a role when experience, skills and abilities of male and female candidates are indistinguishable (17). This suggests that unconscious bias plays a large role in recruitment and selection decisions.

Companies, particularly in the engineering industry, may have issues finding female candidates to fill available positions, thereby preventing progress towards gender-balanced teams. Job advertisements and their wording can have a profound influence on the amount of women that apply: descriptions that use words such as competitive, dominant and leader are less likely to attract female applicants (18). Additionally, it has been found that most women will only apply for a job if they feel that they fulfil 100% of the requirements, whereas men will apply for jobs if they satisfy only 60% of the requirements (19).



RECOMMENDATIONS

- Targets for female graduate and all level recruitment intake.
- Change the wording and focus to create gender neutral job advertisements.
- Track the gender balance of applicants as well as hires.
- Include only the necessary position roles in job advertisements.
- Publicly document actions and support structures utilised in ensuring an inclusive diverse workforce to increase female applications.

"We run workshops with our managers and teams to raise awareness of unconscious bias and the role it can play in decision making." Noël Jones, People Manager – Business Services: Manager Diversity & Inclusion, GHD Pty. Ltd.

THE LEAKY PIPELINE DEVELOPMENT & RETAINMENT

In 2015, there were more men named Peter in CEO or Chair positions of ASX top 200 companies than women (20). In addition, there were an equivalent number of men named Michael in these positions as there were women. In large corporations, men are nine times more likely than their female counterparts to make it to senior executive ranks in large corporations (21).

However, this is just at the top level; the gap in the middle management area is even higher, as this is when the most significant barriers to career progression are encountered by women. As a result, there is a lack of career path and role models visible to young females and graduates, working against retention of these women in the profession: **you can't be what you can't see**.

It has been shown that a critical mass (30%) of women at the top levels of management has a direct correlation with greater retention and attraction to female staff (4).



IN LARGE CORPORATIONS, MEN ARE 9 TIMES MORE LIKELY TO MAKE IT TO SENIOR POSITIONS THAN WOMEN (21)

The CEO of Leading Women, Susan Colantuono, outlined that women require business, strategic and financial acumen to be able to move from the middle to senior management roles. She refers to this as the **missing 33%** of the career success equation for women (22).

Conventional advice for example building personal branding, mentoring and networking are suggested to not assist in closing the gender gap at senior management level. It is noted that these initiatives **do assist** in building confidence and leadership skills. However, it is the **business**, **strategic and financial acumen skills** that are needed to successfully lead a business. That is to move into senior roles.

It is not that women are not capable of acquiring these skills, it is that women are not given training and this advice in their careers.

THE LEAKY PIPELINE DEVELOPMENT & RETAINMENT

RECOMMENDATIONS

- Gender balanced targets for candidacy, promotion or position title
- Implement flexible working arrangements for all employees
- Conduct an annual pay gap analysis and take action where required to fix this
- Celebrate and promote the achievements of women within the company
- Facilitate sponsorship, mentorship and coaching of female employees.
- Foster a diverse and inclusive culture through training and policy
- Encourage senior male leaders and male CEOs to participate in workforce advocacy programs.
- Encourage and promote female leaders and innovators within the workforce
- Champion role models internally and externally that advocate for change
- Constant discussions about gender diversity internally and externally
- Encourage senior women to apply for Engineers Australia Chartered and Fellow status
- Developing business, strategic and financial acumen skills for advancement into senior/executive positions (missing 33%)
- Profiling a range of employees who use different flexible working arrangements to raise awareness and support acceptance.

THE SALARY GAP BETWEEN PROFESSIONAL MEN AND WOMEN IN AUSTRALIA

21% FOR CONSTRUCTION



22%

FOR CONSULTANCY





FOR MANUFACTURING

Q_₽

(23)

WORKPLACE CULTURE

In order to grow and retain the number of women in the engineering profession, it is important to foster an inclusive and diverse work culture, as without a cultural shift, change is not sustainable. Vernã Myers quotes that "diversity is being invited to the party, inclusion is being asked to dance" (24). Inclusion embraces our understanding and appreciation of diverse backgrounds and culture.

Diversity can not be fostered without creating a culture of fairness and respect for everyone.

Engineering can often be a toxic workplace for women, and changing this entrenched culture can be difficult. However, through top down leadership and advocacy from a middlemanagement level from both males and females, this can be achieved.

Traits that are seen as traditionally feminine, such as nurturing, empathetic and expressive, are often viewed as weaknesses when considering leadership roles. Leadership is most often associated with dominance, competitiveness and ambition, traits which are seen as traditionally male characteristics. As a result, women in leadership are often torn between being criticised for displaying typically male traits, or being viewed as incompetent leaders (25).



OF WOMEN IN WORKING IN ENGINEERING HAVE

EXPERIENCED BULLYING (2)

RECOMMENDATIONS

- Encourage CEOs to join workplace diversity advocacy groups
- Regular unconscious bias and inclusive leadership training
- Promote role models internally and externally that advocate for change.
- Use gender neutral and inclusive language.
- Encouraging both men and women to take up flexible working opportuinites.
- Keep constant dialogue and have discussions about change

An important step in changing workplace culture is recognising and removing unconscious bias from processes such as hiring and promotion. Unconscious bias refers to "attitudes or stereotypes that affect our understanding, actions and decisions in an unconscious matter" (26). Often, these unconscious associations do not reflect a person's true beliefs, but rather are activated without awareness and are a product of societal influences. Being aware of unconscious bias enables change to be made, as steps can be taken to mitigate it.

TACKLING PUSHBACK

When introducing targets and policies to improve inclusiveness and diversity, pushback or backlash is often encountered.

It is important that the company and the CEO remain firm in their stance to encourage commitment to change from all employees. When determining which policies or targets to implement, it is extremely important to consult with everyone, and provide the opportunity for open discussions and feedback, as this will allow all members of the company to feel involved.

Some short term consequences of introducing change may emerge, such as (25):

- A drop in females in middle management positions, as they try to avoid scrutiny
- Men become disenfranchised and become vocal in their opposition or actively resist change
- A decrease in performance as focus shifts
- Women ask for increases in remuneration as pay inequities come to light
- Satisfaction of some female employees decreases
- Managers may feel overwhelmed with requirements for change

Backlash to change in "the way things have always been" is a common response, often leading to resistance to change. Gender diversity is often viewed as a "women's issue", when in reality it affects the whole of society.

RECOMMENDATIONS

- Involve all members of the company in the process. In order to prevent backlash, everyone must be involved in process of change. Men and women must work together towards change.
- Remember that backlash can be encountered from both men and women and is part of the process.
- Ensure everyone enjoys the benefits of change.
- Acknowledge that goals may not be achieved in all facets of the business.
- When measures are achieved, strengthen what is put into place in order to accelerate change going forward.
- Encourage the right behaviours and practises that allow people of different genders to collaborate together.
- Accept all points of view.
- Provide workshops and raise awareness of different leadership and communication styles between men and women.

THE POWER OF LANGUAGE

The choice of words used in the implementation of gender diversity action can have an impact on the way people think and act. Language can be used to include or exclude groups, encourage or discourage participation, and unite or divide people.

The choice of words used in the implementation of gender diversity action can have an effect on the way people think and act. Language can be used to include or exclude groups, encourage or discourage participation, and unite or divide people.

Language can be used to attract women into engineering: words associated with masculinity, which are typically used in advertisements of STEM jobs, have been found to decrease the likelihood of women applying (18). By using inclusive gender-neutral language that emphasises enthusiasm, growth, and innovation, employers can potentially widen their talent pool. Similarly, language would contribute to the rebranding of the engineering profession.

Gender neutral and gender inclusive language should be used in all internal and external communication, particularly policies, to foster an inclusive culture (27). For example, maternal leave and paternal leave should be implemented as the gender neutral/agnostic term parental leave, so that all employees feel entitled to take it.

To reduce pushback and a knee-jerk reaction to gender diversity action, the connotations of words must be considered. The measures do not necessarily need to be called targets, phrases such as Key Performance Indicators (KPIs), measures, goals and objectives can be used to the same effect depending on the climate of the business. Targets in shortlists could be redressed as "gender-balanced shortlists".



"Where women feel unsuccessful at influencing masculine work cultures, they are less likely to remain within the organisation." Dr. Karen Morely, Executive Coach, Karen Morley & Associates

ARE WE A MERITOCRACY?

The engineering industry and society is often thought of as a meritocracy, where success and advancement is purely based on skill and effort. Measures to increase diversity, such as gender diversity, can often be seen as undermining meritocracy.

The engineering industry and society is often thought of as a meritocracy, where success and advancement is purely based on skill and effort. Measures to increase diversity, such as gender diversity, can often be seen as undermining meritocracy. However, the evaluation of merit is not entirely unbiased. Where available, stereotypes such as gender, ethnicity, religion, age, and disability will always be used to evaluate people. There is significant evidence that demonstrates that there is a bias against females during hiring and promotion.

- Male applicants are rated as more competent and hireable than an identical female applicant (28).
- Salary growth is higher for men than women in the same job and department and under the same manager (29).
- Women are less likely to be promoted (30).

While we may believe that the best person should get the job, it does not necessarily happen in practice. Consequently, measures such as the ones outlined in this report are required to ensure that the talented women, who would otherwise be overlooked, are able to succeed.

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CONCLUDING REMARKS

It's not all doom and gloom. We have come a long way however there is still a long way to go. In an industry which loves numbers, it's time to put some numbers on gender diversity and it's time to call for targets. Like any aspect of a business which is considered imperative to business success, targets are a good actionable step in the right direction to start to make a change to gender diversity. Making actionable changes and focusing on outcomes can help to collectively tip the needle towards a more gender diverse workforce.



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