

# Assessment of policy-society interface to increase female participation: A study of Aerospace engineering in the Maldives

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## Abstract

This study aims to identify and analyse the various factors leading to low female participation in Maldivian aerospace industry and discuss the policies required to improve this sector. Using a qualitative method, data from both male and female aerospace engineers were collected and content analysis was used to identify themes. The results show a range of barriers influencing Maldivian women to study and participate in aerospace engineering. How the society tended to generalise all types of engineering which resulted in several misconceptions around the aerospace industry was seen. The research discusses how to improve the education and engineering policies and its interface with the Maldivian society. This work would be of use to engineering educators, policy makers and education institutions to change their practices to increase gender equity in this area. It focusses on SDG 4, 5, 8 and 10.

## Introduction

Women remain underrepresented in engineering despite an increase in their participation over the years (Davies, 2022; Engineering UK, 2023; U.S Census Bureau, 2021). Looking at aerospace engineering sector, UN (2021) reports that female participation was only around 20% for the past 30 years globally. EEOC (2021) reports comments that only 20% female aerospace engineers overall were female, showing a significant disparity. Increasing women's participation in engineering is critical not only to meet the demand for skilled workers and the economy, but also to close the gender gap in male-dominated fields, create diverse, innovative, and creative workplaces, bring different perspectives to teams, and achieve SDGs (Bonfield and Tull, 2021; Bakthavatchaalam et al., 2019; OECD, 2011).

UNICEF (2019), UNESCO (2019, 2015) and Frawley (2005) comment on how gender disparities that children are exposed to during their early education influences their career choices. Similar aspects were observed in higher education (Smith et al., 2012) and at school levels (Sosale et al., 2023).

Under-representation of females in engineering is compounded by negative family and societal attitudes, deterring young girls from pursuing careers in STEM (Wentling and Camacho, 2008). Bakthavatchaalam et al. (2020) found how deep-rooted socio-cultural beliefs in South India impacted female participation in STEM, with families often 'sheltering' or creating a dependency of the daughters on the family, thus affecting females' career opportunities. Similar trends are observed in the neighbouring islands of the Maldives. This study

examines the interaction between the socio-cultural system in the Maldives and the opportunities for females in aerospace engineering.

## *Aerospace engineering in the Maldives*

Maldives, a South-Asian island nation, relies heavily on tourism for its economy (NBS, 2022). Given its island geography, Maldives has a thriving air transport market, operating both domestic and international flights (Cummins, 2020; IATA, 2018), which presents ample opportunities for aerospace engineers in the country.

Gender disparities persist among working women in the Maldives, despite a 6.2% increase in the female labour force in the last eight years (IFES, 2020; Quinn, 2011). Women are mainly employed in healthcare or education, aligning with global trends (BLS, 2021; MoHE, 2020; UNESCO, 2015), and regardless of their occupation, face conservative views that tie them to household duties (Faisal, 2021; Ibrahim, 2017). Moreover, female engineering graduates may choose to pursue careers where their skills are better appreciated. All these together contributes to the low number of females in engineering graduates.

Maldivian girls have limited exposure to STEM fields, particularly aerospace engineering, which impacts their career choices from a young age. Koh et al. (2021) found that rural girls were surprised to see women in STEM careers. Female students in secondary schools face greater obstacles when selecting a career path based on their interests and passions compared to male students, who are encouraged to pursue STEM studies. Family recommendations play a significant role in women's

career choices, and traditional gender roles continue to hinder women's participation in all industries, including engineering, in the Maldives (UNDP, 2019; Shafina, 2020; El Horr and Pande, 2016).

## Need for Research

This study is relevant in the Maldives as there is a lack of research on women in aerospace engineering, which hinders the country's efforts to achieve gender equality in this field. While existing researches focus on gender disparities in STEM, they might not be applicable to the developing aerospace sector. Therefore, it is vital to identify and address gender disparities and implement policies to increase female participation in the sector, which could positively impact SDGs 5, 8, and 10.

## Methodology

Due to the novelty of the research in the Maldives, a qualitative methodology was deemed appropriate. Semi-structured in-depth interviews were conducted to identify patterns and discrepancies in the experiences of male and female aerospace engineers. The sample included four female and four male participants who were either enrolled in or had recently graduated from aerospace engineering program. The interviews were recorded, transcribed, and subjected to content analysis for data analysis purposes.

## Results

All the participants acknowledged the lack of female representation in the Maldivian aerospace industry. The study revealed significant differences and shared perceptions between male and female engineers in terms of their experiences. Notable differences were observed in the attitudes of families, society, and the engineering community towards female participation. However, some concerns were shared between genders, particularly regarding their school education and career guidance. The report will focus on several key factors that were identified as important in the study

### *Reasons for Choosing Aerospace*

Participants in the study shared a common interest in aerospace engineering and excelling in mathematics and physics, thus choosing to study aerospace. However, their paths to discovering the field differed by gender. Male participants had greater family support and access to resources compared to females who had

to seek information independently and lacked social capital. Limited accessibility to resources and support for females lowered their participation in STEM, especially for those with fewer social and economic resources (ADB, 2007).

Females reported a lack of career-specific guidance during secondary education, making it difficult to choose a clear higher education path. Gender stereotypes and biases from teachers negatively impacted female students' decisions and led to a drop-in physics and mathematics-related subjects. These biases discouraged females from pursuing their desired career paths, reduced their confidence, and fostered a detrimental mindset.

### *Family Support and Impact*

Male participants received more family support in pursuing aerospace engineering, while female participants faced discouragement from family due to patriarchal beliefs. One female engineer reported that her family did not understand why she chose a career in aerospace engineering based on her passion and interest, rather than a conventional career path for women.

Traditional beliefs in the Maldives reinforce gender roles and discourage women from pursuing "masculine" careers that may involve mobility and that could conflict with family responsibilities. This observation is consistent with findings of Bakthavatchalam et al. (2020) in India and Faisal (2021) and Shifna (2021) in the Maldives.

Such biases create societal subconscious bias, making fulfilling gender roles more important than personal development. Some families are attempting to adopt a more progressive mindset, but this is not yet widespread.

### *Attitudes of the Society and Engineering Community*

Most participants noted society's lack of awareness about the diverse range of roles associated with engineering, perpetuating the misconception of it being a "man's job" that requires physical labour. These reinforced patriarchal views of gender roles in careers and negatively impacted women in the field. Additionally, female engineers reported not receiving the same level of respect as their male colleagues even after joining the industry and being underestimated as engineers by their male colleagues, reflecting deep-rooted cultural beliefs and social stigmas. Such treatment often led to demotivation and self-doubt in female.

Female engineers recounted instances where they were underestimated and given menial or "easy" tasks in the workplace. Participants also observed that women were underrepresented in senior positions and received less respect than men, regardless of qualifications, leading to a perception of an unwelcoming work environment with a lack of female peers and low probability of job progression.

## Policy Recommendations

The challenges faced by Maldivian women in aerospace engineering, among other factors, were attributed to insufficient educational guidance, deeply entrenched cultural beliefs, and the absence of female representation in the industry. Therefore, policy recommendations will prioritise these issues.

### *Awareness and Education*

To promote gender equality in engineering, a comprehensive approach is required. It should involve education, awareness-raising, support, and mentorship programs for women in engineering, and policy changes that promote gender equality in education and employment. Such an approach requires long-term cooperation from society to challenge deeply ingrained beliefs. UNESCO (2017) suggests several mechanisms that could be used, including awareness programs in schools and society, quotas, gender-responsive career counselling, and positive promotion of women in STEM.

Addressing biases in the classroom requires teacher and school counsellor training to recognise their own biases and address them. Gender-neutral career guidance emphasising the importance of pursuing interests and passions should be provided by schools. In addition, communities and families should be encouraged to support their daughters' interest in engineering. The design and implementation of national policies to address these issues would also be a beneficial step in the right direction.

In Maldivian society, there is a significant lack of understanding of aerospace engineering. Raising awareness and educating the public about the field is crucial in challenging gender norms and related misconceptions.

### *Unbiased & Career-Oriented Studies*

Currently, Maldivian schools lack career-oriented studies (Corporate Maldives, 2018). Establishing a career-oriented education system that appeals to female's interests and passions is essential to increase gender equity in engineering. This can be achieved by

designing curricula that are inclusive and relevant to females, and that highlight the real-world applications and impact of engineering. Additionally, career-oriented studies can provide female students with opportunities to engage in hands-on engineering projects and research, which can increase their confidence and interest in the field.

It is crucial for the education professionals to receive training to eliminate conscious and unconscious gender biases or stereotyping when teaching and offering career guidance to children. Providing unbiased teaching can build self-esteem and confidence in girls and create a positive attitude towards science-related subjects.

### *Industrial policies*

Many qualified female engineers tend to leave or switch career paths due to the discriminatory work environment. To retain female engineers in the field and create a welcoming workplace, companies should invest in policies promoting equality and diversity and reducing patriarchal norms. These could include inclusive hiring processes, flexible working arrangements, mentorship programs, and equal opportunities for career advancement. Such policies would encourage female representation in higher positions and foster an inclusive work environment. Additionally, companies should provide unconscious bias training, establish affinity groups for underrepresented groups, and promote diversity and inclusion policies to eliminate gender bias. These efforts would attract and retain talented female engineers.

## Conclusion and future work

The study identified major obstacles facing female aerospace engineers in the Maldives and proposed measures to improve the situation. Recommendations include education reform, awareness-raising among parents and teachers, equitable policies in aerospace industries, and safe spaces.

However, the small sample size limits generalisability, and future research should use quantitative methods. A nationwide study could reveal intercultural differences, leading to localised policies. Longitudinal studies could identify factors affecting female aerospace engineers at different career stages.

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