

Ameliorating the profound gender wage gap in the architecture, engineering and construction (AEC) industry among the APEC members: The could and should

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Abstract

This research aims to discover the challenges and propose effective strategies to empower women by ameliorating the gender wage gap in the architecture, engineering and construction (AEC) industry among the APEC members. The study applied document review analysis and conducted focus group discussions, where thirty female professionals in the AEC industry from APEC participated. The results report four challenges contributing to the gender wage gap, namely gender bias and stereotyping, work-family conflicts, physical strength and lack of transparency. Based on the challenges, the study suggests several key strategies focusing on women's participation in the AEC industry, encouraging gender-friendly workplaces, healthy and safe workplaces, and fair career development opportunities to reduce the gender wage gap effectively. The findings suggest that by increasing awareness of the value of women's involvement in the AEC industry, pragmatic policies should be formulated for APEC members to break down the barriers to the gender wage gap.

Keywords: Gender inequality, Wage gap, Women in the AEC industry, Empowering women, Workplace strategies

Introduction

The United Nations (UN) has consistently emphasised the significance of addressing gender inequality and empowering women within a nation, explicitly formulating SDG No. 5 and SDG No. 10 as measures to alleviate this widespread disparity. Gender equality circumscribes many aspects and has always been a bandwagon for many societies. As early as 1989, Asia-Pacific Economic Cooperation (APEC) leaders have constantly been underscoring inclusive growth to address disparities in income, skills, jobs and opportunities, especially in the architecture, engineering and construction (AEC) industry. The APEC Gender Inclusion Guidelines (GIG) formulation glaringly highlighted the issue of gender inequality among APEC members (APEC, 2022). Currently, the global female workforce participation rate is under 47% (International Labour Organization, 2022), reflecting the underrepresentation of females in the AEC industry. According to the Bureau of Labor Statistics (2022) in the United States (US), in 2020, only 10.9% out of 47% of the nation's female workforce was in the construction sector. The numbers showed that in the job field, women are almost invisible in the AEC industry.

The AEC industry exhibits significant gender wage disparities, with women earning 27% less than men (World Economic Forum, 2022). Women's median weekly earnings in civil engineering and construction management were lower than men's in 2020 (US Bureau of Labor Statistics, 2020). Female executives also faced a wage gap, receiving 34% less than male counterparts from the same cohort (Naoum et al., 2020; Seneviratne, 2020). Although the wage gap narrowed within companies over time, it remained a significant issue (Grimson & Grimson, 2019; Litman et al., 2020). The representation of women in the architecture industry increased but only accounted for 41% of newly licensed architects in the US (National Council of Architectural Registration Boards, 2022). Moreover, women held only 28% of management positions among the top 100 architecture firms (Barker, 2022), and the civil engineering workforce had a low representation of 16% (Bureau of Labor Statistics, 2022). Addressing these disparities remains essential for achieving gender equality in the AEC industry (Javakhadze & Shelton, 2022).

Increased female participation in the workforce notably impacts the wage gap between male and female workers, particularly in male-dominated fields such as the AEC industry (Fan & Sturman, 2019). Studies indicate that the pay gap is more significant among less educated female workers, and this disparity is linked to the underrepresentation of women in the AEC sector (Manesh et al., 2020). Efforts have been made to address this issue, including gender equality legislation prohibiting discrimination and ensuring equal pay (Brinded, 2017; Cantillo & García, 2014; Naoum et al., 2020). APEC has recognised the need to bridge this gap and aims to increase women's participation in non-traditional sectors like construction, where the average architect's salary is significantly higher than the average yearly income in APEC economies (APEC, 2022; Yang et al., 2022). However, traditional perceptions and biases have hindered women's progress in the AEC industry, resulting in lower pay and limited career advancement opportunities compared to their male counterparts (Baker, 2022; Manesh et al., 2020).

Although the gender pay gap has been extensively studied for some decades, the research is still an ongoing trend (Manest et al., 2020). The inequity has long been

discussed, and the social dimensions in culture, such as masculinity (Hofstede, 2002), could explain the international differences in the gap size. Despite a long effort to formulate HR policies to alleviate the gap, it is still a significant issue in HR studies, especially among the APEC members. This paper aims to enhance women's participation and contribution in the AEC industry by comprehending the challenges linked to the gender wage gap, devising strategies for promoting women's engagement at all management levels and reducing barriers to achieving wage equality, thus highlighting the importance of Human Resource policies and workplace culture in achieving equal opportunities and addressing gender pay disparities. This study is of paramount importance in addressing the uncertainties (the 'could') and potential factors contributing to the gender wage gap and earning disparity. It is hoped that the motivation behind this study may reveal (the 'should'), for example, insights, and assist in tailoring strategies and policies to address it (Javakhadze & Shelton, 2022). Studying the gender wage gap in the AEC industry may yield several significant contributions to academia and society, particularly policy development, gender equality advocacy and social awareness (Yang et al., 2022).

Literature Review

Theoretical Grounding

Substantive Equality Theory and Model of National Culture Differences

The concept of the gender wage gap is backed by Fredman's (2016) theory of substantive equality, which highlights the underlying structural inequalities and disadvantages faced by specific groups, especially regarding gender inequality in the workplace. Fredman's work has significantly impacted legal and policy discussions relating to gender equality, anti-discrimination laws and human rights. Her theories have advanced conversations on social justice and inclusive communities by providing a framework to understand and address inequality's complex and diverse nature. Understanding how different forms of discrimination interrelate and how various disadvantages affect individuals is crucial in comprehending the issue of gender inequality's contribution to the gender wage gap. For instance, it is important to explore further the social, economic, and cultural factors contributing to existing inequalities to achieve substantive equality.

Cultural influences also shape the gender wage gap, providing additional justification and theoretical grounding for this study. Since gender roles vary across cultures, perceptions of the gender wage gap may differ in other countries (Hofstede, 2002). In some societies, a conservative notion persists that women are secondary earners, which supports traditional methods of evaluating compensation and incentives (Manesh et al., 2020). In certain contexts, the gender pay disparity might not be considered discriminatory but rather seen as an accepted norm. For instance, in Asian cultures, it is often believed that women tend to earn lower incomes compared to men because they are typically not expected to be the primary providers for their families. This perception stems from the prevailing masculine norms in these societies (Hofstede, 2002).

Gender Inequality in the AEC Industry

Globally, women are vastly underrepresented in the AEC industry and face enormous

barriers. Recognising the extent of gender wage imbalance among developed countries and APEC members could be the first step in achieving gender wage parity. Measures were undertaken to generalise the results on a cross-countries basis. For example, the Gender Inequality Index (GII) sheds light on gender differences in employment, empowerment, and health. The higher numbers in the GII reflect lower accomplishments, in contrast to the Global Gender Gap Index (GGI) (UNDP, 2022). Table 1 shows the rankings among the APEC members in relation to GII (year 2021) and GGI (2022).

Table 1: Gender Inequality Index (GII) and Global Gender Gap Index (GGI) Rankings among APEC Members

	APEC Members	GII Ranking 2021	GGI Ranking 2022
1.	Chinese Taipei	-	-
2.	Hong Kong, China	-	-
3.	New Zealand	25	4
4.	Philippines	101	19
5.	Canada	17	25
6.	Mexico	75	31
7.	Australia	19	43
8.	United States	44	27
9.	Singapore	7	49
10.	Chile	47	47
11.	Peru	90	37
12.	Thailand	79	79
13.	Russian Federation	50	-
14.	Indonesia	110	92
15.	Viet Nam	71	83
16.	Brunei Darussalam	61	104
17.	Malaysia	57	103
18.	China	48	102
19.	Republic of Korea	15	99
20.	Japan	22	116
21.	Papua New Guinea	161	-

Note: Some data in the reports did not cover the Russian Federation, Papua New Guinea, Chinese Taipei and Hong Kong, China.

Based on the rankings for both GII and GGI, the data signifies that the gender pay gap exists in all APEC members, with developing countries still facing a high gender pay gap. The ranking is surprising, as some countries with the lowest gender wage gap are not necessarily progressing toward close gender equality, for example, Japan. One plausible explanation is the social dimension in culture among countries in Asia (Hofstede, 2002), where organisations manage to match the salary for female workers against male workers but with a low representation of female workers.

Trends across APEC Members

Wage disparity between genders continues to endure, as women earned only 70 per cent of what men did in the region in 2022. Additionally, among the 21 APEC countries, only 11 have implemented laws addressing equal compensation for women and men performing work of equivalent value (Hernando, 2023). APEC members have been actively working to address the gender wage gap through various strategies. Many

APEC members are signatories to international conventions, such as the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) and the Constitution of Women's Human Rights by the UN General Assembly in 1979, to promote gender equality (APEC, 2022). APEC members have also implemented public policies that tackle gender inequality to create more opportunities for women in the AEC industry and break down structural barriers. Initiatives like the APEC Policy Partnership on Women and the Economy (PPWE) and the La Serena Roadmap for Women and Inclusive Growth (2019-2030) aim to facilitate women's equal participation and integration into the digital economy, incorporating gender equality and women's economic considerations to elevate women's influence in the APEC region (Hernando, 2023). However, despite these efforts, progress in closing the gender wage gap remains inconsistent among APEC members.

APEC Members – Canada, US, Papua New Guinea, Peru, Chile, Mexico, and Russia

As a developed country in APEC, Canada has taken significant steps to close the gender wage gap by implementing the Pay Equity Act in 2021, ensuring equal compensation for equally valuable work by women and promoting economic recovery post-COVID-19 (Government of Canada, 2021). However, despite these efforts, women in Canada still earn 89 cents for every dollar men earn. In the US, federal and state laws, including the Federal Equal Pay Act (1963), aim to promote pay equity among genders. Nonetheless, women in the US still earned 17% less on average than men in 2022 (Bolotnyy & Emanuel, 2022).

Other APEC members have also implemented specific policies to address gender pay inequality. For example, Papua New Guinea leads a project to enhance women's economic participation and productivity through "Gender Smart Workplaces." Peru and Chile have established national gender equality policies, and Mexico is empowering women through STEM education. Russia focuses on family policies and pension formulas to support women in the workforce (OECD, 2022; APEC, 2022; Kingsbury, 2019). Despite these efforts, gender wage gaps persist among APEC members.

APEC Members – Australia, New Zealand, Japan, Singapore, Hong Kong -China, Korea, Chinese Taipei

In Asia, Australia is considered one of the more successful APEC members in progressing towards gender equality in the construction industry. The Victorian Government's Women in Construction Strategy and the Workplace Gender Equality Act aim to promote women's employment in construction and improve equal remuneration (Victorian Government, 2022; Sharma et al., 2019). However, the gender wage gap in Australia remains significant, with women earning AUD 263.90 less than men on average (Australian Bureau of Statistics, 2022).

New Zealand faces a 10% wage gap between men and women in 2022, with limited female representation in higher-level positions. The government has taken steps to address this issue, amending the Equal Pay Act to empower employees and unions to make pay equity claims directly. Implementing the Public Service Gender Pay Gap Action Plan has significantly reduced the gender pay gap (New Zealand Government, 2022).

In contrast, Japan and Korea, both advanced Asian countries and APEC members, struggle with wide gender wage gaps that have not significantly improved. Despite implementing policies such as Individual Action Plans for Women's Representation, the Act on Promotion of Gender Equality, and the Gender Parity Law in Japan, progress remains slow (Dalton, 2022). In Korea, policies like the Framework Act on Gender Equality and efforts to address cultural norms have not led to noticeable improvements (Kim et al., 2019; OECD, 2022).

Chinese Taipei, Hong Kong-China, and Singapore are making notable progress in narrowing the gender wage gap. Chinese Taipei's Office of Gender Equality and policies like Equal Pay Day and the Act of Gender Equality in Employment support gender equality (OECD, 2022). Hong Kong-China maintains gender-neutral pay policies, although the gender pay gap persists. Singapore has made efforts to reduce the gap, but women still earn around 6% less than their male counterparts in the same job (Lin et al., 2020).

APEC Members (Emerging Asia) – China, Indonesia, Malaysia, Philippines, Thailand and Vietnam

China's economic progress was propelled by the Reform and Opening-up Policy, leading the government to implement equal employment policies. The initiative aimed to encourage the active participation of women, epitomised by the slogan "*Women hold half of the sky.*" (Iwasaki & Ma, 2020). Over the years, the effects of the Chinese government policies have significantly reduced the gender wage gap compared to other Asian countries due to the reformation and transition to a market-oriented economy that allows more women to be employed with matched wages.

In Southeast Asia, the majority of women earn between 30 and 40 per cent less than men; additionally, just 55% of women participate in labour on average (Iwasaki & Ma, 2020). The lack of gender equality and employment opportunities for women cost the region's economy an estimated 18% of its gross domestic product (World Economic Forum, 2022). Indonesia has shown promising progress in closing the gender wage gap as the only nation in Southeast Asia where women's salaries have increased considerably over the years (Hallward-Driemeier et al., 2017). Nevertheless, the cultural perspective of women exacerbates gender wage gaps where women's relative employment prospects in the AEC industry are limited. In Malaysia, there has been frequent discussion related to the issue of the gender wage gap. Still, the difference between men's and women's average salaries has not decreased during the previous ten years (Najib & Majid, 2021). One of the nine targets under Malaysia's Shared Prosperity Vision 2030 measures is in place to safeguard women against discrimination. Women's rights reformation has been proposed before the political upheaval in early 2020, including the Sexual Harassment Act, Gender Equality Act, anti-stalking legislation, paternity leave, and protection against job discrimination (Najib & Majid, 2021).

The Philippines' long-term objective is to increase the participation of women in discussions regarding gender equality. The Philippine Commission on Women contributes to this objective by emphasising areas of women's empowerment. The Magna Carta for Women 2008 and The Women's Priority Legislative Agenda developed comprehensive policies for the government to adopt and eliminate current

discriminatory laws that limit the capacities of all women. These substantial advances helped in closing the gender wage gap, but the progress in this domain was affected by the COVID-19 pandemic (Lavado et al., 2022). In Thailand, progress has been made in addressing the gender wage gap; however, disparities persist in sectors traditionally dominated by males, such as the construction industry. (Thi Bui & Permpoonwiwat, 2015). Targeted policies such as the Women's Development Strategy were created within the context of the 20-year National and serve as a roadmap for Thai government planning initiatives (OECD, 2022). Similarly, to promote gender equality in economic activity, labour supply, and employment in Vietnam, the existing system of laws and regulations has produced a rather extensive legal framework. For instance, the Vietnam Women's Union, which has 13 million members nationwide, is an organisation reducing the gender gap in Southeast Asia and putting gender equality laws into practice (Obermann et al., 2021). Although Vietnam has made tremendous progress in reducing gender inequality, there is still a salary disparity between men and women.

In summary, APEC members have already made strides toward reducing the gender gap in Southeast Asia. However, even if the region's female involvement rates have grown, more work has to be done to guarantee that equality policies are established in all spheres of Southeast Asian society and that chances are not denied to women. It bears noting that there are still significant differences in the gender wage pay among APEC members despite various policies and actions governments and agencies took to cope with the issue.

Understanding the Challenges Behind the Gender Wage Gap

Many studies were conducted to observe the gender wage gap. For example, Karamessini and Ioakmoglou (2007) mentioned the human capital model to explain the wage gap, which reflects the educational backgrounds, shorter tenures and women's interrupted careers. The discussion shows that the determinants for closing the gender wage gap are women, who typically outperformed men in terms of educational attainment and work experience (Gawel & Mroczek-Dabrowska, 2020).

Brinded (2017) describes the challenges through the labour market segmentation theory, which focuses on primary and secondary labour markets, including wage structure, industry type, job autonomy and job opportunities. Women often work in industries with lower labour productivity and limited career options, possibly due to their household duties that are geared toward women being paid less than men, which widens the income gap. Women in construction are subjected to more significant risks of discrimination as the industry is linked to stressors like physical effort, adaptation to harsh outdoor working conditions, abusive language, long working hours, job insecurity, poor professional worth, temporary working teams, and a poor work-life balance (Castellano et al., 2020). Women are forced to leave despite their wish to continue in the profession due to gender stereotyping and workplace culture. As a result, female engineers scored higher than their male counterparts in terms of work-life conflicts and turnover rates. Moreover, the lack of transparent employment and pay practices will likely cause gender pay gaps. Organisations lacking family-friendly policies could negatively impact female salaries, accounting for wage gap variance (Fan & Sturman, 2019).

From the document analysis, the study identifies the key theories relevant to the existing

literature related to the gender wage gap. Drawing from the Substantive Equality Theory by Fredman (2016) and the Model of National Cultural Differences by Hofstede (2002), this study aims to explore the challenges (the 'could') faced by women concerning the gender wage gap in the AEC industry among APEC members. It puts forward strategies along with actionable plans (the 'should') to address the challenges.

Methodology

Research Design

Using the qualitative research design, document analysis and multiple focus group discussions were applied as a means of data triangulation to ensure the credibility of evidence (Eisner, 1991). Multiple focus group discussions are a method to gather attitudes, views, values, expectations, and viewpoints, allowing researchers to reach data saturation and develop emergent points (Marshall et al., 2013). Appendix B provides the questions derived from the literature and document analysis for guiding the multiple focus group discussions.

Sample

Using purposive sampling, thirty female professionals from the AEC industry among the APEC members were predetermined as the sample size for the multiple focus group discussions. The predetermined sample size of thirty was considered adequate as data saturation was achieved as points derived from the document analysis were then confirmed in the multiple focus group discussions (Bernard & Bernard, 2013). The target sample must be female professionals working in the AEC industry for at least five years and holding managerial posts. The female leaders were selected due to their specialised knowledge and experience in discussing the gender wage gap in the AEC industry. These criteria would ensure the data collected is valid and informative. To achieve a balanced representation in the sample, the participants selected from professionals holding the top management positions in the AEC industry, i.e., professional bodies, construction developers, consultants, and academicians among APEC members from Australia, New Zealand, Malaysia, Indonesia, Taiwan, China, Mexico, Philippines, Vietnam, and Thailand. Table 2 shows the participants' backgrounds in the focus group discussions.

Table 2: Background of Participants Involved in the Focus Group Discussions

Affiliation from the AEC Industry in APEC members	Numbers of professionals	Average years of working experience
Consultant	2	30
Constructor	4	25-30
Developer	4	25-30
Professional body	8	20-30
Public Sector	8	20-30
Academic	4	25-30
Total	30	-

Data Collection

The study incorporated deliberative focus group discussions to explore significant topics, reinforcing the findings from the document analysis phase. The integration of both document analysis and focus group discussions facilitated a comprehensive investigation into the complexities of the gender pay gap and its associated factors (Miles et al., 2018).

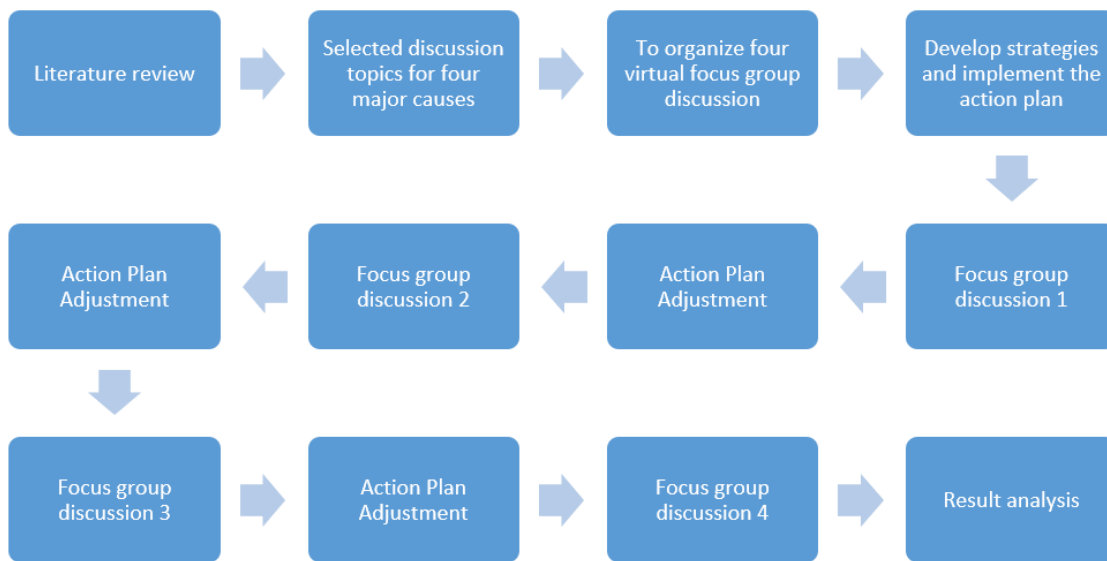
The participants were randomly divided into four focus group discussions in the next stage, with each stage consisting of 7-8 participants. The four focus group discussions enable the researchers to revise and fine-tune the strategies and action plans because as participants interact, their ideas may create and develop new thoughts (Carey & Asbury, 2012). The focus group discussions took approximately two hours to complete using Google Meet. Verbal consent was obtained from the participants to participate in the focus group discussions, and the data was kept anonymous. Figure 1 shows the research methodology flowchart of the study.

The first step for the focus group discussion process is to define the purpose of focus group interviewing, which is to empower APEC women's involvement in the AEC industry. In the second step, the facilitator provides appropriate guidance, including an introduction, clarification of terms, main causes, and strategies. The third step is to conduct one-on-one question-and-answer sessions. The procedure, questions and answers, and summaries were recorded by the recorder meeting during the process. The strategy for the next discussion was based on the results of each focus group discussion. The results and discussions were obtained after four group discussions.

Coding and Analysis

Transcriptions were coded using content analysis (Stepchenkova, 2012). The researchers read through the transcripts independently, focusing on how the professionals viewed the challenges faced by females and what strategies and actions they believed could be fostered to narrow the gender wage gap. In addition, thematic analysis was employed to assess the recurring themes in the codes and texts (Braun & Clarke, 2006). The texts that were then reported as quotes in the findings were those that were thought to be relevant to support the codes. The qualitative descriptive design was used to analyse textual material that provides an in-depth social-contextual interpretation of the issue under discussion (Miles et al., 2018). The inter-coder agreement was also employed to navigate individual researchers' subjective interpretations of the data for triangulating and validation purposes. Prior to the discussion, it was to support and develop themes based on codes and phrases (Braun & Clarke, 2006).

Figure: 1 Research methodology flowchart of the study



Results and Discussion

Findings from Document Analysis

The study examined previous literature addressing the primary factors contributing to the gender wage gap and potential strategies and action plans. The research commenced with an extensive document analysis, wherein pertinent keywords associated with the "gender pay gap" were identified from reputable databases like Science Direct and Scopus. This initial phase produced 34 papers for further scrutiny. To enhance the precision of the analysis, supplementary keywords such as "gender bias and stereotyping," "work and family conflicts," "physical strength," and "transparency" were integrated, leading to a more concentrated set of 14 papers (see Appendix A). The findings and reviews provide clues about the literature on the gender wage gap. For example, the challenges of the gender wage gap still persist among some countries and industries with similar trends of keywords such as "gender bias, and existing interventions or policies in the literature. The preceding document analysis reviews suggest a need for further scrutiny, specifically addressing the multifaceted nature of the gender wage gap, which this study addresses through focus group discussions.

Findings from the Focus Group Discussions

Challenges of the Gender Wage Gap

The challenges of the gender wage gap in the AEC industry were investigated using content and thematic analysis. The contents of the conversations with 30 female professionals were interpreted and thematised. Four significant challenges were identified and categorised into four themes, which are (1) "Gender Bias and Stereotyping", (2) "Work Family Conflicts", (3) "Physical Strength", and (4) "Transparency". The quotes are identified from focus groups (FG) and participants (P).

Theme 1: Gender Bias and Stereotyping. Bias and gender stereotyping in the AEC industry might occur throughout the employment cycle. The results of the focus group discussions show that gender stereotyping impacts women's decisions to work in the

AEC industry. In the construction industry, this gender stereotyping leads to a preference for male engineers. Women in construction jobs face significant challenges, including limited promotion opportunities and the perpetuation of gender stereotypes. Consequently, gender-based occupational segregation hinders women's career advancement and contributes to the gender wage gap, particularly in male-dominated sectors like the AEC industry.

Quotes from the focus group:

"We notice that women are underrepresented in the construction industry in the APEC region. It is a critical issue to the discussion. It deserves our best effort to create a more diverse, inclusive workplace." (FG3/P5)

"Well, it is popular ... to know that women faced some hiccups at construction companies, ...for example, [erm]..not much promotion opportunity and many people think women are weaker [physically]when work at engineering field." (FG3/P6)

"..... I believe this gender pay gap is not really a problem in the Philippines, especially in the education sector. But I guess in the engineering companies; I think there is where the gap exists." (FG3/P10)

Theme 2: Work-Family Conflicts. Work-family conflicts are common among workers in all nations, reinforcing gender inequality and the gender pay gap because women are more likely to leave their jobs. Fan and Sturman (2019) reported women might have 'career breaks' associated with child-rearing that affect their work in the labour market. These negatively impact women applicants' chances of getting an interview, an offer, and a promotion and thus reinforce gender inequality and the gender pay gap. The literature review shows that the characteristics of the working pattern in the building sector make work-family conflicts worse for women engineers (Manesh et al., 2020).

Quotes from the focus group:

"...professional women engineers are tougher, especially with family and children. It is extremely difficult to solve this problem with work and family time in manageable ways..." (FG2/P1)

Theme 3: Physical Strength. The participants pointed out the challenges of women working in the AEC industry due to their physical limitations compared to men. Construction work in the AEC industry is expected to be risky, for example, construction site supervision and long working hours at hazardous sites. Besides the high risk of work injuries, women are more likely to face gender-based violence and might be excluded from tasks that require some form of physical constraints and long hours of labour. Construction sites are quite often in remote or sparsely populated locations, and it could be difficult for women with families to travel and work night shifts.

Quotes from the focus group:

"Basically, this gender inequality issue [in the AEC industry], normally engineering works [is] . specific for men, [for example] carrying cement, sand and [in] a very hot

and dusty environment, very tough and it's not for ladies because ladies, we are weaker [physically]...." (FG3/P12).

Theme 4: Transparency. The lack of transparency in the workplace, particularly in salary and safety, was mentioned during the focus group discussion. Women in the AEC industry are often kept hidden from the salary criteria and promotion opportunities, which become a discriminatory factor for women working in the AEC industry (Baker, 2022; Cantillo et al., 2014). The condition of workspaces in the AEC industry is not favourable to women in relation to potential safety and abuse issues.

Quotes from the focus group:

"Even with Labour Unions, is it not clear in workspaces where performance measurement is not ensuring women's safety and opportunities." (FG1/P5)

Strategies and Action Plans

Through the content analysis, the relevant data were grouped into four strategies and several action plans.

Strategy 1: Education and training to encourage women's participation in the AEC industry to reduce gender bias and stereotyping

It is essential to have a workplace free of gender bias and stereotyping to reduce the gender wage gap. One of the ways is through fundamental education and awareness campaigns, whether in family, school, or workplace. To reduce gender bias and stereotyping, awareness needs to start at the family level and early at school, where teaching strategies could encourage girls to enrol in maths, science and engineering courses and pursue employment in the AEC industry. Furthermore, boys could be educated to accept the fact that girls can perform similarly in male-dominated industries. It is also recommended that gender awareness courses and training programs be administered in the workplace to create awareness towards gender bias and stereotyping.

Quotes from the focus group:

"We need to educate the man starting from the original family, let them have responsibility to take care of the children, elder as well. Family education is the key." (FG3/P2)

"Gender equality education should be included in the courses." (FG1/P5)

"School education is very limited to help in the workplace, and I even think that gender inequality does not exist, and there is no gap between men and women, and if there is, the concept can be corrected through workplace education." (FG2/P1)

"The on-job training already has the technical skill and job safety, so these courses have to be carefully crafted to be really useful and consequential, they could not just be just another hour or (a) couple of hours of training. There have to be some meaningful results coming out of it." (FG4/P4)

In summary, Table 3 shows five action plans proposed for Strategy 1

Table 3: Action Plans for Strategy 1

Strategy 1	Action Plans
Education and training to encourage women's participation in the AEC industry to reduce gender bias and stereotyping	<ol style="list-style-type: none"> 1) Inclusion of gender awareness courses in schools and on-the-job training programs. Promoting awareness of legislation is essential in addressing gender-based violence and discrimination. This includes eradicating gender stereotypes and safeguarding equal rights in the workplace, ensuring fair access to skills training, promotions, and equitable compensation for comparable work. 2) Requirement for gender awareness courses to be incorporated in the retraining of professional engineers, site managers, safety and health management personnel, and quality control engineers. 3) Notifications of gender bias or gender stereotyping are to be broadcasted through different media, including radio and television. To review the Radio and Television Act to raise gender awareness through broadcasting. 4) Conduct courses on gender equity and a series of events focusing on females as role models to be included in primary and secondary education. 5) Review and propose education and training to ensure gender awareness courses are a requirement in the Occupational Safety and Health Education and Training Rules and related policies.

Strategy 2: Gender-friendly workplace to manage work-family conflicts

The work-family conflicts often create a dilemma for women. This is especially relevant during the COVID-19 pandemic, where women work from home while caring for their families. Moreover, it is a challenge in the AEC industry, especially small and medium-sized firms, to provide childcare or eldercare support as a measure of employee work-life balance. Nevertheless, efforts can be included to arrange for flexible work and a mechanism for an employee to work remotely (Castellano et al., 2020). Collaborating with government agencies enables AEC firms to offer childcare and eldercare support for their female employees. Most importantly, through education and awareness programs, society could take a step to change the perception of women as the sole family carer and that men can play the same role in handling work-family conflict. Moreover, labour laws can be revised to accommodate women's needs better and intertwine with family-friendly legislation (Hilal et al., 2022), which can be the key factor in alleviating work-family conflicts.

Quotes from the focus group:

"Both men and women (should) harmonise, encourage men to be family oriented and take responsibilities from their partners" (FG4/P5).

"The current Labor Standards Law for the construction industries needs to consider

performance evaluation, workplace and time." (FG2/P1)

"The firm needs [to be] flexible and feasible, depending on the performance of the companies. For example, how many hours does it takes to draw a construction drawing, and give flexible time." (FG2/P3)

To understand and value the importance of work-family balance, Table 4 below shows a list of action plans to support Strategy 2.

Table 4: Action Plans for Strategy 2

Strategy 2	Action Plans
Gender-friendly workplace to manage work-family conflicts	<ol style="list-style-type: none"> 1) Firms to provide flexible work arrangement options, such as flexible work time, work-from-home benefits, compressed workweeks and part-time work scheduling 2) To amend labour standards acts and related regulations to promote flexible work arrangements in the AEC industry 3) Firms to provide sufficient technology tools that support employees to work remotely 4) Firms to offer temporary childcare and eldercare in collaboration with certified government agencies 5) To establish regulations for family and childcare services agencies that provide childcare and eldercare to firms 6) Promote the importance of family duties and shared responsibilities that encourage men's participation in childcare and eldercare.

Strategy 3: Healthy and safe workplace strategy to ensure manageable physical strength in the workplace

The engineering environment and construction site are hazardous and potentially dangerous to workers, which is an existing impediment for women (Castellano et al., 2020). The difference in physical ability between men and women resulted in a predominantly male workforce deployment in the AEC industry. It is possible to reduce physical restrictions through technology and automation that could lower the risks of work injuries on construction sites. According to Mariam et al. (2020), providing women access to appropriate equipment and workplace infrastructure can be advantageous. However, when implementing technology, such as cameras in construction sites, careful review and the development of policies are necessary to address potential privacy concerns that may arise from their usage. Balancing the benefits of technological advancements with privacy protection is crucial in creating a supportive and inclusive work environment for women in various industries, including construction.

Quotes from the focus group:

"Using information technology and cameras around the site is helpful." (FG2/P1)

"There are currently automated [system] that are aided by pre-cast lifting through Camp 4.0. This is to ensure safety at the site." (FG2/P5)

"Application of real-time cameras is quite sensitive it wouldn't be accepted in isolated most of the countries" (FG4/P5)

Based on the data collection on physical strength as a challenge to the gender wage gap, some action plans were developed, as shown in Table 5.

Table 5: Action Plans for Strategy 3

Strategy 3	Action Plans
Healthy and safe workplace strategy to ensure manageable physical strength in the workplace	<ol style="list-style-type: none"> 1) Application of information technology and cameras around the sites to ensure a safer environment and with the understanding and agreement of employees 2) Application of technology systems and automation to reduce physical restrictions of on-site work by streamlining the internal operational processes. 3) Provide proper facilities such as toilet access and breastfeeding rooms at the sites, and regularly check facilities, such as elevators and lighting. 4) Inclusion of education safety, risk and health in the curriculum so that students are aware of the legal norms to protect their rights in workplaces 5) Review the Occupational Safety and Health policies or related regulations to safeguard women in the work environments, such as eliminating dark or hidden areas.

Strategy 4: Fair career development opportunities strategy to warrant transparency in the workplace

Transparency is essential to eliminating gender pay gaps, particularly in organisations' HR policies and practices. Maintaining transparent employment and pay practices will likely prevent gender pay gaps, helping attract and retain a diverse and committed workforce (Castellano et al., 2020). From the focus group discussions, participants believe that companies are responsible for reporting information regarding salary gaps and transparent career opportunities. The described strategy aligns with United Nations Sustainable Development Goal (SDG) No. 5, which emphasises the importance of granting women full and effective participation and equal leadership opportunities in decision-making processes (United Nations, 2022). Additionally, it complements UN SDG number 10, which advocates for the implementation of fiscal, wage, and social protection policies to progressively achieve greater gender equality. To achieve these goals, companies are encouraged to establish targets for the representation of women in management positions, promoting gender diversity and inclusivity within their organisational structures.

Quotes from the focus group:

"Company have social responsibility to disclose the issue on this pay scale." (FG3/P2)

"Salary announcements can be helpful." (FG1/P6)

"Good to have them [companies]to disclose just a general summary of the gender ratio and pay gap. Policies should be incorporated to protect women at work..."

Table 6 summarises the action plans to support Strategy 4 with the information gathered from the focus group.

Table 6: Action Plans for Strategy 4

Strategy 4	Action Plans
Fair career development opportunities strategy to warrant transparency in the workplace	<ol style="list-style-type: none"> (1) Require organisations in the building sectors to publish general information on the pay gap ratio annually. (2) Organise training activities that acknowledge outstanding women for knowledge transfer and networking in the AEC industry. (3) Develop a promotion and salary system that considers the differences in positions, such as technical and research and development fields, so employees can be promoted according to their respective professions. (4) Monitor the status and progress of participation in managerial decision-making and gender pay differences by the architecture and engineering associations or related agencies. (5) Develop government policies to promote equal pay and provide employers with the opportunity to review their organisations' incentives and pay systems for gender equality. (6) Establish acts governing the administration of professional engineering consultants and architecture firms that allow them to amend related regulations to expose gender pay gaps. (7) Promote successful cases of companies who are champions in closing the gender wage gap and practising gender diversity.

In conclusion, the study of the gender wage gap in the AEC industry underscores the need for proactive measures. It highlights significant disparities (the ‘could’), emphasising the importance of addressing the gap not just for justice but also for industry and societal well-being. Collaboration and equitable practices are essential (the ‘should’) for a more inclusive, innovative, and prosperous future.

Practical Implications for Asian Business

For practitioners in Asia, this research presents implications to the APEC members,

who advocate for the necessity of acquiring 21st-century skills in order to boost employee competency and, as a result, sustain regional economic growth. Human capital is necessary to contribute to the region's development by contributing to economic growth, and women should play a contributive role, particularly in the AEC industry. In accordance with the APEC directives, this paper offers some insights in relation to the gender wage gap in the AEC industry among the APEC members and provides some strategies and recommendations to support a better workplace in support of equality.

The study provides a comprehensive geographical overview of the gender wage gap in the AEC industry in order for practitioners to understand the current trends of the gender wage gap in the APEC members, in particular, developing countries in Asia. The study will also assist the construction sector in better comprehending the wage gap, pursuing further research into the issue, and trying to close the gap to increase the number of female workers in the AEC industry. It is important that practitioners in the AEC industry make an effort to understand current issues in the area of labour and personnel, especially workplace diversity and discrimination.

In addition, the results of this study might be helpful for human resources managers in the AEC industry. Human resources practitioners can use the results to compare the gender wage disparity in their companies or nations to neighbouring ones in APEC members. Because there is a continuing need for workers in the AEC industry, it is reasonable to believe that women are a source of the workforce that could respond to this overwhelming demand. Long-term costs will rise as a result of a constant loss of construction workers in the AEC industry and could impact the building and construction needed for the country's development. Therefore, public policies may be created to lessen the more considerable pay inequalities compared to neighbouring countries, possibly with some government assistance to the suffering AEC industry and building sectors. Countries or companies that publicly commit to addressing diversity, equity, and inclusion issues can act as a catalyst for improving the gender wage gap among the APEC members in the AEC industry.

The present study is limited to only covering the APEC members, and the results may not represent the overall population. This area of research is still emerging, evidenced by the lack of empirical studies on the gender wage gap in the AEC industry. It is important to address this social issue with more sustained commitment and comprehensive actions through future studies that cover a broader context. Future studies are recommended to examine a deeper relationship between the gender wage gap and other additional factors, such as overtime work, increased risk-taking in the workplace and compensation factors, to name a few. Other recommendations for future research could include controlled variables, such as demographic details among women workers, to obtain more accurate results in the study of the gender wage gap.

Acknowledgement

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Appendix

Appendix A: List of Publications Studied for the Document Analysis

1.	[1-1]	Kaewsri, N., and Tongthong, T. (2013). "Professional Development of Female Engineers in the Thai Construction Industry." <i>Procedia-Social and Behavioral Sciences</i> . DOI: 10.1016/j.sbspro.2013.08.508.
2.	[1-2]	Seneviratne, P. (2020). "Gender wage inequality during Sri Lanka's post-reform growth: A distributional analysis." <i>World Development</i> . DOI:10.1016/j.worlddev.2020.104878.
3.	[1-5]	Appleby, K., Bullinger, B., and Schneider, A. (2018). "STEM selves: Women's identity projects and their assessment of future employers in technical fields." <i>Scandinavian Journal of Management</i> . DOI:10.1016/j.scaman.2018.09.001.
4.	[1-6]	Fortin, N.M., Bell, B., and Böhm, M. (2017). "Top Earnings Inequality and the Gender Pay Gap: Canada, Sweden, and the United Kingdom." <i>Labour Economics</i> . DOI: 10.1016/j.labeco.2017.05.010.
5.	[1-7]	Spencer, S.M., Blazek, E.S., and Orr, J.E. (2019). "Bolstering the female CEO pipeline: Equalising the playing field and igniting women's potential as top-level leaders." <i>Business Horizons</i> . DOI:10.1016/j.bushor.2018.10.001.
6.	[1-8]	Sharma, J., Yarlalagadda, T., Sharma, S. and K.D.V.Yarlalagadda, P. (2019). "Vertical Segregation: Issues and Challenges of Women Engineers in Australia." <i>Procedia Manufacturing</i> . DOI: 10.1016/j.promfg.2019.02.074.
7.	[1-9]	Homroy, S., and Mukherjee, S. (2021). "The role of employer learning and regulatory interventions in mitigating executive gender pay gap." <i>Journal of Corporate Finance</i> . DOI: 10.1016/j.jcorpfin.2020.101857.
8.	[2-2]	Naoum, S. G., Harris, J., Rizzuto, J., and Egbu, C. (2020). "Gender in the construction industry: Literature review and comparative survey of men's and women's perceptions in UK construction consultancies" <i>Journal of Management in Engineering</i> . DOI:10.1061/(ASCE)ME.1943-5479.0000731.
9.	[2-3]	Grimson, J. and Grimson, W. (2019). "Eliminating gender inequality in engineering, industry, and academia." <i>Philosophy of Engineering and Technology</i> . DOI:10.1007/978-3-319-99636-3_15.
10.	[2-4]	Mariam, A.T., Olalusi, O.B., and Haupt, T.C. (2020). "A scientometric review and meta-analysis of the health and safety of women in construction:structure and research trends." <i>Journal of Engineering</i> . DOI:10.1108/JEDT-07-2020-0291.
11.	[2-X-1]	Infante-Perea, M., Román-Onsalo, M., and E. Navarro-Astor. (2016). "Perceived career barriers for future female and male Spanish building engineers: Case of occupations related to work on site." <i>J. Prof. Issues Eng. Educ. Pract.</i> 142 (4): 04016007. https://doi.org/10.1061/(ASCE)

		EI.1943-5541.0000286.
12.	[2-X-2]	Dainty, A.R.J, Bagilhole, B.M. and Neale, R.H. (2000). "A grounded theory of women's career underachievement in large UK construction companies." <i>Construction Management and Economics</i> , 18(2), 239–50. DOI: doi.org/10.1080/014461900370861
13.	[2-X-4]	English, J.,and Hay, P. (2014). "Black South African women in construction: cues for success." <i>Journal of Engineering, Design and Technology</i> . DOI: doi.org/10.1108/JEDT-06-2013-0043
14.	[1-x-1]	Ford, D. and Rohini, P. (2011). "Gender Quotas and Female Leadership: A Review."

Appendix B: Samples of Focus Group Discussion Guide/Questions

	Key Topic	Literature	Main Questions	Probing Questions
1	Challenges faced by women in AEC industry	Dainty et al., 2000 Naoum et al, 2020 Seneviratne, 2020	<ol style="list-style-type: none"> 1. Please share with us the challenges that you faced in your current workplace. 2. Can it be anything related to personal or workplace policies? 3. How about your opinion about overall gender wage gap? 4. Why do you think gender wage gap still exists in your current workplace? 	<ol style="list-style-type: none"> 1. Can you share with us any examples of the challenges you mentioned just now? 2. Any example of gender wage gap? 3. Is it due to personal, weakness or just perceptions of community?
2	Strategies and Action Plan	Kaewsri & Tongthong, 2013 Mariam et al., 2020 Homroy & Mukherjee, 2021 Grimson & Grimson, 2019	<ol style="list-style-type: none"> 5. In your own opinion, what can we do to cope the challenges that you mentioned before? 6. Do you think current policies are helping? 7. What can the community do to cope this challenge? 	<ol style="list-style-type: none"> 4. Who do you think can help with gender wage gap issue in your workplace? 5. How about company? Society? Country?



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