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Perception of the Involvement of FKAAB UTHM Female Graduates in the Construction Sector From the Aspects of External and Internal Factors

Nuramanina Ayob[1], Nur Syamimi Mohd Razali[1*]

[1] *Faculty of Technical and Vocational Education,*
Universiti Tun Hussein Onn Malaysia,
86400, Parit Raja, Batu Pahat, Johor, MALAYSIA

*Corresponding Author: syamimi@uthm.edu.my
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Abstract

Issues concerning women's participation in the construction industry remain relevant, particularly among engineering graduates entering the workforce. The construction sector is widely perceived as male-dominated and associated with physically and mentally demanding work environments. These perceptions can negatively influence female graduates' interest in pursuing careers in the field. This study aims to examine the perceptions of female graduates from the Faculty of Civil and Built Environment Engineering (FKAAB) regarding their potential involvement in the construction industry. The analysis considers both external and internal influencing factors. External factors include salary prospects, work environment and the availability of training and mentorship. Internal factors involve family support, levels of stress and fatigue and self-efficacy in facing workplace challenges. A quantitative research approach was employed, involving a survey of 298 FKAAB female graduates who completed their studies between 2020 and 2024. Data were collected using structured questionnaires and analyzed through descriptive and inferential statistics using SPSS version 27. Findings from the descriptive analysis indicate that both external and internal factors significantly influence female graduates' inclination to join the construction sector. Pearson correlation analysis further reveals a significant relationship between these two categories of factors. Overall, the study highlights the importance of balancing material support and psychological resilience in enhancing women's confidence to participate actively in the construction industry. It is recommended that both industry stakeholders and higher education institutions adopt more holistic and supportive strategies to strengthen women's engagement in this sector.

1. Introduction

Women's participation in the construction sector is not a new phenomenon. However, their representation remains low, as many perceive the industry as an unattractive career option (Hickey & Cui, 2020). This

perception is influenced by various factors, particularly gender stereotypes embedded in both society and the workplace. Women are often seen as less competent in technical and managerial roles, which hinders their advancement within the field (Jalal et al., 2019). Such stigma not only reduces women's interest in entering the construction industry but also limits their presence in leadership and professional positions.

Civil engineering plays a key role in equipping students with the knowledge and skills needed for the construction industry (Xue & Jing, 2024). Research has highlighted the importance of a balanced skill set among civil engineering graduates, including technical expertise, management capabilities, and soft skills such as problem-solving, teamwork, resilience, and self-confidence (Gómez et al., 2021; Murray et al., 2022). Employability skills, particularly project management and transferable competencies, are increasingly emphasized to meet current labor market needs (AlMunifi & Aleryani, 2019). Integrating these competencies into engineering curricula through innovative teaching methods, such as problem-based learning, can enhance graduates' preparedness for the industry.

In Malaysia, the construction sector is one of the top contributors to the national economy. It plays a vital role in economic development by creating jobs and stimulating investment (Serogina et al., 2022). Efficient project management in this sector contributes to national socio-economic goals, including improved quality of life and infrastructure development (Khaertdinova et al., 2021). Therefore, the sustainability and efficiency of the construction sector are essential to achieving long-term economic growth and social well-being.

The involvement of female graduates in the construction industry is influenced by multiple dimensions including career advancement opportunities, workplace culture and informal institutional constraints. Factors such as the potential for career growth, competitive salaries and self-efficacy are key drivers behind women's career decisions in this field (Oo et al., 2020). In many cases, women choose construction-related disciplines based on perceived opportunities for professional development and income, often encouraged by peer influence. The sector's ability to offer clear pathways for advancement is critical in motivating women to pursue careers aligned with their goals and aspirations (Bogedain et al., 2024). The objectives of this study:

1. To identify the key external factors influencing FKAAB female graduates' decision to enter the construction sector
2. To identify the key internal factors influencing FKAAB female graduates' decision to enter the construction sector
3. To examine how these internal and external factors relate to the participation of FKAAB female graduates in the construction sector

2. Literature Review

2.1 Construction Sector

The construction industry plays a vital role in national development, contributing significantly to economic growth, employment and the implementation of government policies in areas such as education, healthcare, housing and infrastructure (Jaber et al., 2020; Khaertdinova et al., 2021). It provides essential socio-economic infrastructure, including roads, hospitals and schools (Daoud et al., 2020). Despite its importance, the industry is known for its high rates of accidents, injuries and fatalities (Dehghan et al., 2023).

Key challenges in the sector include project delays, high costs, dependence on manual labor and workforce diversity in terms of physical ability, culture and experience (Adinyira et al., 2020). Mental health issues are also prevalent, driven by job insecurity, long working hours and limited organizational support, particularly during the COVID-19 pandemic (Soundarya Priya et al., 2022). Additionally, construction companies face workforce shortages, ageing labor, resistance to change and the need to adapt to digital transformation and sustainable practices (Zairul & Zaremohzzabieh, 2023; Tafti et al., 2022; Nair & Suresh, 2021). Addressing these challenges requires attracting new talent, supporting worker well-being, and innovating business models.

2.2 Women's Participation in the Construction Sector in Malaysia

The construction industry in Malaysia is a significant economic sector that influences career choices, especially among women (Mohammed Kamaruddeen et al., 2023). According to the Department of Statistics Malaysia, construction accounts for 10% of employment, behind services and manufacturing.

The industry is often viewed negatively due to poor welfare facilities, hazardous working conditions, and perceptions of the work as dirty, technical, and demanding (Rostiyanti et al., 2021). These factors discourage women from entering and remaining in the sector. Challenges for women include wage gaps, discrimination, sexual harassment, lack of organizational support, long working hours, remote locations, and inflexible schedules (Salamah & Widaningsih, 2022a; Desai & D'souza, 2024).

Women are underrepresented in construction, with few in leadership roles and more likely to hold administrative positions rather than technical roles (Valitherm, 2021; Rostiyanti et al., 2020). Organizational culture and gender bias often limit their career progression despite equal qualifications (Shiang, 2020; Moorthy et al., 2022). Addressing these barriers is essential to improve women's participation, retention, and advancement in the construction sector. Solutions include promoting supportive work environments, flexible schedules, and fair performance evaluations to reduce discrimination and improve job satisfaction (Ghanbaripour et al., 2023a; Shanthi & Rani, 2022).

Making the right career choice is essential, as it impacts future income, job type, social status and overall life satisfaction (Fernandez, 2023). A poor career decision may lead to negative long-term outcomes. Therefore, career decisions should be based on thorough self-assessment, considering personal strengths, interests, and capabilities. Key influencing factors include education, personality, gender, age and socioeconomic background. For instance, vocational students often choose careers that align with their interests and social or technical personality traits relevant to their field of study (Rafizi Taha et al., 2022).

3. Methodology

This study employed a quantitative survey design to enable direct data collection from participants within a limited timeframe, thereby ensuring objectivity and supporting the statistical validity required to address the research questions and meet the study objectives. This study focuses on female graduates from the Faculty of Civil and Built Environment Engineering (FKAAB) who completed their studies between 2020 and 2024. The total population of this study is 1341 women graduates, and a random sampling technique was employed to ensure fair representation. To determine the sample size, Krejcie and Morgan (1970) formula was used, which is expressed as follows:

$$S = \frac{X^2 \cdot N \cdot P(1-P)}{d^2(N-1) + X^2 \cdot P(1-P)}$$

where:
S = required sample size
N = is the total population (1341),
P = population proportion (assumed to be 0.5 for maximum sample size)
D = degree of accuracy (margin of error), usually 0.05
X^2 = the table value of chi-square for 1 degree of freedom at the desired confident level (3.841 for 95% confidence)

Based on a total population of 1341 female graduates from FKAAB, the required sample size was determined to be 298 as suggested by Krejchie and Morgan's (1970) sample size determination table. This ensures statistical validity at a 95% confidence level with a 5% margin of error. However, the study acknowledges that feedback from the entire population would provide more accurate and comprehensive results.

Data collection was conducted through a questionnaire developed based on adaptations from previous studies (Sidin, 2020; Hamzah et al., 2021). The instrument comprises items designed to assess the perceptions of female FKAAB graduates regarding their involvement in the construction sector, focusing on both external and internal factors. The questionnaire underwent a validation process through expert review by three specialists in the fields of education and civil engineering. Table 1 presents the structure of the questionnaire, which is divided into several main sections such as Section A covers Respondents Demographics, Section B focuses on perception of FKAAB women graduates' involvement in the construction sector from the aspect of external factor and Section C assesses perception of FKAAB women graduates' involvement in the construction sector from the aspect of internal factor.

Table 1 *Sections and Items of the Questionnaire*

Sections	Item of Sections	No. of Questions
A	Respondents Demographics	5
B	Perception of FKAAB Women Graduates' Involvement in the Construction Sector from the Aspect of External Factor	21
C	Perception of FKAAB Women Graduates' Involvement in the Construction Sector from the Aspect of Internal Factor	21

Data were collected using the Google Forms platform and disseminated via email, with a two-month window provided for survey completion. Ethical standards were upheld through the acquisition of informed consent and the assurance of participant confidentiality. The data is analyzed using SPSS version 27.0. To analyze demographic characteristics and general responses, descriptive statistics, such as means and standard deviations were employed. Pearson correlation analysis was utilized to explore the relationship between external factors and internal factors.

The questionnaire used in this study was adapted from previous research and includes external and internal factors. External factors consist of salary return, work environment and training also guidance, which measure respondents' perceptions of pay competitiveness, workplace safety, comfort and availability of support or training. Internal factors include fatigue and work stress, family commitment and self-efficacy, which assess perceptions of workload pressure, the influence of family responsibilities and confidence in performing construction-related tasks. Women graduates' participation is measured through their interest and intention to enter the construction sector.

Based on Table 2, Cronbach's Alpha was calculated to assess the internal consistency of the questionnaire. Additionally, a pilot study involving 30 respondents was conducted prior to the main data collection to validate the instrument and ensure the clarity and reliability of the survey items.

Table 2 *Cronbach's Alpha Value*

Variables	Item Number	Cronbach's Alpha Value
External Factors Influencing Female FKAAB Graduates to Join the Construction Sector	21	0.94
Internal Factors Influencing Female FKAAB Graduates to Join the Construction Sector	21	0.97

4. Results and Discussion

The analysis in this study is structured into three main sections: respondent demographics; perceptions of FKAAB women graduates' involvement in the construction sector from the perspective of external factors; and perceptions of their involvement from the perspective of internal factors. The subsequent section presents the inferential analysis conducted to examine the relationship between external and internal factors.

4.1 Respondents Demographics

Based on Table 3, which presents the demographic findings of the respondents, it can be analyzed that in terms of age, the findings indicate that the majority of respondents were aged between 25 and 27 years (34%), The analysis revealed that the majority of respondents were married 161 respondents (54%), while 137 respondents (46%) were single. Based on the findings, 215 respondents (72.1%) held positions as engineers, representing the highest proportion and a total of 165 FKAAB female graduates (55.4%) were employed in contractor firms, The largest group comprising 138 respondents (46.3%), had 4–6 years of experience. These findings indicate that most respondents had substantial experience in the industry, which may contribute to more informed and engaged responses regarding career-related issues in the construction sector.

Table 3 *Demographic Findings of Respondents*

Demographics	Frequencies	Percentages (%)
Age		
22-24 years	22	9.70
25-27 years	104	34.90
28-30 years	77	25.80
30 years and above	88	29.50
Marital status		
Single	137	46.00
Married	161	54.0
Current position		
Project Manager	6	2.00
Engineer	215	72.10
Site Supervisor	29	9.70
Quantity Surveyor	5	1.70

Others	43	14.40
Working company		
Contractor	165	55.40
Consultant	72	24.20
Developer	15	5.00
Government sector	28	9.40
Others	18	6.00
Working experience		
<1 years	39	13.10
1-3 years	121	40.60
4-6 years	138	46.30

4.2 Analysis of Dominant External Factors Influenced Women Graduates

Based on Table 4 shows that respondents generally rated the external factors related to salary, work environment and training as medium level. Most agreed that salaries and benefits are fair but only moderately satisfying. The work environment, including safety, gender respect, and support from colleagues and employers, is seen as somewhat positive but could improve.

Training and guidance also received medium ratings. Respondents feel that the training programs and support from supervisors and senior colleagues help them understand industry needs and motivate them to stay in the sector. However, there is still room to improve the quality and effectiveness of training and support.

In summary, this study found that training and mentoring are the strongest external factors that encourage female FKAAB graduates to enter construction sector. Graduates who received industrial training, technical courses or guidance from mentors are more likely to pursue a career in the industry. This supports Bahrami et al. (2022) who reported that mentoring helps women handle workplace challenges, maintain work-life balance and stay in the industry.

Table 4 *Distribution of Mean Scores, Standard Deviation, and Mean Interpretation for External Factors*

No.	Item	Mean Score	Standard Deviation	Mean Interpretation
B1	I am satisfied with the salary offered in the construction sector.	2.46	1.38	Medium
B2	The salary offered in the construction sector is commensurate with my academic qualifications.	2.43	1.37	Medium
B3	The benefits package includes components such as bonuses, allowances, and incentives.	2.83	1.57	Medium
B4	The salary offered in the construction sector is commensurate with the workload assigned.	2.32	1.33	Medium
B5	The salary offered in the construction sector is sufficient to cover my cost of living.	2.59	1.40	Medium
B6	I am satisfied with the wage structure offered to female workers in the construction sector.	2.42	1.37	Medium
B7	The salary offered is a contributing factor in my decision to work in this industry.	2.49	1.39	Medium
B8	A safe and well-organized working environment encourages me to remain in the construction industry.	2.94	1.59	Medium
B9	A work environment that respects gender diversity enhances my confidence to remain actively engaged in the construction sector.	3.00	1.63	Medium
B10	Support from colleagues motivates me to remain engaged in the construction sector.	3.18	1.63	Medium
B12	My employer provides a conducive working environment for women in the construction sector.	3.01	1.59	Medium

B13	Occupational Safety and Health Administration (OSHA) policies are effectively implemented in the workplace within the construction sector.	3.13	1.61	Medium
B14	I feel comfortable and confident working in the construction sector environment as a woman.	3.05	1.58	Medium
B15	The training provided by construction companies assists me in understanding the actual requirements of the industry.	3.08	1.57	Medium
B16	I received adequate guidance during my industrial training in the construction sector.	2.98	1.54	Medium
B17	A quality training program enhances my confidence to engage in the construction sector.	3.08	1.57	Medium
B18	The technical training provided aligns with the skills required in the construction sector.	3.09	1.57	Medium
B19	The training and guidance received have assisted me in making the decision to remain in the construction sector	3.13	1.61	Medium
B20	Support and guidance from senior colleagues provide motivation for continued involvement in this field	3.27	1.66	Medium
B21	I believe that guidance from supervisors plays a crucial role in the involvement of women in the construction industry.	3.28	1.67	Medium

4.3 Analysis of Dominant Internal Factors Influenced Women Graduates

The data in Table 5 indicates that internal factors influencing female graduates' involvement in the construction sector generally receive moderate agreement, as shown by mean scores ranging from 2.94 to 3.28, all interpreted as medium.

The results from Table 5 show that internal factors moderately influence female graduates' participation in the construction sector. Family support and acceptance of their career choices are important motivators. Respondents also reported being able to balance family responsibilities with work commitments. They generally feel confident managing daily work pressure, adapting to heavy workloads, and using strategies to reduce fatigue. Despite the physical and mental demands of the job, interest in continuing in the sector remains steady. Additionally, respondents expressed moderate self-confidence in performing tasks, interacting with stakeholders, and overcoming challenges. They believe their skills are sufficient and that they can compete equally with male colleagues. Overall, these findings highlight that family support, personal resilience, and confidence play key roles in encouraging women to stay and succeed in the construction industry.

Table 5 *Distribution of Mean Scores, Standard Deviation, and Mean Interpretation for Internal Factors*

No.	Item	Mean Score	Standard Deviation	Mean Interpretation
C1	Support from my family encourages me to pursue a career in the construction sector.	3.13	1.63	Medium
C2	My family is supportive of my career choice in the construction sector.	3.21	1.66	Medium
C3	Encouragement from my parents has given me the confidence to be involved in the construction sector.	3.15	1.64	Medium
C4	Family responsibilities do not prevent me from being involved in the construction sector.	3.17	1.64	Medium

C5	My family members/partner understand the work demands of the construction sector.	3.21	1.64	Medium
C6	I am able to balance a career in the construction sector with my family responsibilities.	3.07	1.61	Medium
C7	Commitment to my family does not diminish my interest in working in the construction field.	3.13	1.62	Medium
C8	I am able to manage the daily work pressure in the construction sector effectively.	2.94	1.53	Medium
C9	I can adapt to the high workload in the construction sector without affecting my performance.	3.00	1.54	Medium
C10	I have effective strategies to reduce fatigue after working in the construction sector.	3.18	1.53	Medium
C11	I am able to manage my emotions effectively when facing work-related stress at the construction site.	3.02	1.50	Medium
C12	I am able to maintain a balance between work and personal life despite working in the construction industry.	3.01	1.55	Medium
C13	I take measures to manage fatigue resulting from work in the construction sector.	3.13	1.53	Medium
C14	I remain interested in continuing in the construction sector despite its high physical and mental demands.	3.05	1.60	Medium
C15	I am confident in my ability to perform tasks effectively within the construction sector.	3.08	1.60	Medium
C16	I have high self-confidence when interacting with stakeholders in the construction industry.	2.98	1.60	Medium
C17	I am able to overcome challenges in the construction sector with the skills and knowledge I possess.	3.08	1.60	Medium
C18	I believe that I am on par with my male colleagues in performing technical tasks within the construction sector.	3.09	1.61	Medium
C19	My skills and knowledge are sufficient to succeed in the construction sector.	3.13	1.57	Medium
C20	I am able to quickly overcome failures or mistakes in my work.	3.27	1.58	Medium
C21	I am confident that my high self-confidence motivates me to remain in the construction sector.	3.28	1.65	Medium

5. Conclusion

The study findings clearly indicate that, regarding external factors, training and guidance are the dominant influences, while for internal factors, family support and self-efficacy significantly affect female graduates' decisions to join the construction sector. Furthermore, the decision of female graduates to pursue a career in construction is not solely dependent on academic qualifications but is significantly influenced by a combination of both external factors such as salary returns, work environment, and training and internal factors including family support, pressure and stress, as well as self-efficacy. Therefore, it is evident that both external and internal factors have a significant relationship with their involvement in the sector.

The findings of this study highlight that female graduate from FKAAB have the potential to contribute to the low representation of female engineers in the construction sector of this country. However, these graduates are identified as having low self-confidence to engage in a sector predominantly dominated by males. Ironically, despite the introduction of various policies aimed at empowering women's participation in the construction industry, the actual involvement of women in technical positions remains low, and FKAAB female graduates still express hesitation in pursuing careers within this sector.

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Conflict of Interest

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

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