

Enchanting women's interest in the construction industry: The role of digitalisation

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Abstract:

Although males dominate the construction industry as women are seldom given the benefit of the doubt to showcase their capabilities and skills, the use of Construction 4.0 technologies could be the optimal catalyst for providing flexibility and mobility of women professionals within the South African construction industry. In light of the above and the advent of digitalisation, a quantitative study, which involved an online questionnaire, was conducted. Architects, construction managers, construction project managers, engineers, and quantity surveyors within the construction industry were approached to determine the potential of digitalisation to attract and retain women in the construction industry. The salient findings are: the construction industry is a male-dominated sector; there is a general lack of women's participation and involvement in the construction industry; digitalisation could be a useful tool to enchant the interest of women in the construction industry; the construction industry entails high workloads and long hours; a patriarchal culture that threatens people's work-life balance exists in the construction industry; there is non-adherence to the constitutional equality clause; digitalisation can help enchant women's interest and involvement in the construction industry, and the construction industry possesses optimism towards digitalisation whilst showing reluctance in its implementation. Based on the findings, using digitalisation and technological systems within the workplace could stimulate women's interest in the construction industry. This would redress the prevailing discriminatory and male-dominated tendencies currently characterising the South African construction industry.

Keywords:

Construction, digitalisation, diversity, women

1 Introduction

Globally, and in South Africa, the construction industry is as old as human existence, despite gradual modifications to the business of construction and projects. However, the industry has birthed new dynamics, one being an overt lack of women involvement and advancement of their careers. Across the world, a shortage of skilled labour, particularly women, exists in this sector (Vijayaragunathan and Rasanthi, 2019), despite its being one of the largest employers

with over 28% in industrial employment. Statistics have shown that men generally outnumber women in the industry. This is despite the existence of the Constitution of the Republic of South Africa 1996, legislative interventions such as the Broad-Based Black Economic Empowerment Act 53 of 2003 (BBBEEA), the Promotion of Equality and Prevention of Unfair Discrimination Act 2 of 2000 (PEPUDA), and the Employment Equity Act 55 of 1998 (EEA) to mitigate inequality (Mpemba, 2019).

The South African construction industry struggles with what The National Association of Women in Construction (2013) refers to as the issue of 'presenteeism', which concept relates to creating the wrong perception to colleagues and superiors that you can endure excessive working hours as opposed to being just as productive within a short time frame. It automatically assumes that an employee is not working if absent from site with site-based jobs, which in practice, may not necessarily be the case. At times, the attraction of long hours on-site may be due to the compressed schedule on the project in deference to the stakeholders' expectations (The National Association of Women in Construction, 2013).

In South Africa, the industry continues to be dominated by men, and women are not taken seriously (Agherdien and Smallwood, 2008). South Africa's construction industry accounts for a large part of the country's economic growth and performance. Even though the sector employs over 1.4 million South Africans, thereby contributing to the economy (Osunsanmi *et al.*, 2018), and that women account for about 41.3 percent of the general workforce, their involvement in the construction sector has not been paralleled, when compared to men at the level of management (Agherdien and Smallwood, 2008). Women are reportedly trapped in middle and junior management roles, though an increasing number of women are now entering this male-dominated sector (Agherdien and Smallwood, 2008). Yet, the construction industry suffers from unequal opportunities between men and women (Haupt and Ndimande, 2019). In fact, despite the provision of the equality clause in Section 9 of the Constitution of the Republic of South Africa, 1996, in addition to statutory provisions to mitigate the contentious issue of gender inequality, the construction industry is notably still a highly dominated male sector (Mpemba, 2019). Indeed, the industry is characterised by all forms of gender discrimination, sexism, and patriarchal tendencies. The above situation leaves many unanswered questions: How can women's participation and involvement in the construction industry be increased? Is South Africa's built environment ready for digitalisation? Can it solve the current challenges facing women?

Therefore, it is necessary to stimulate women's interest in the construction industry due to a growing economy, which is being catalysed by technological progression. Given this, women need at least to maintain their share in the different sectors and occupations, and they need to be empowered if they want to, in the end, be in a better position to capture occupations brought by automation which will occur in the future (Mckinsey Global Institute, 2019).

However, limited studies have been conducted concerning the role and importance of women's career development in this sector (Rosa *et al.*, 2017). Furthermore, a research gap exists in the form of a possible role to be played by digitalisation in terms of attracting women to the construction industry. In an endeavour to contribute to the related body of knowledge,

this research aimed to determine whether the use of digitalisation can enhance women's interest in the construction industry, the objectives of the study being to determine the:

- Factors that hinder women's participation in the construction industry;
- Extent to which digitalisation is experienced and practiced;
- Likelihood of digitalisation enhancing participation by women in the construction industry, and
- Factors that support Construction 4.0 technologies that will facilitate and enhance the participation of women in the construction industry.

2 Literature Review

2.1 Culture and organisational culture

Aboagye-Nimo *et al.* (2019) contend that the industry unfortunately, cultivates an image that it is only for men and this characterises an unwelcoming male culture towards women to the extent of normalising the reduction of their capabilities and abilities within the construction industry. The National Association of Women in Construction (2013) argues that, due to the prevailing *status quo*, women must commit to the grassroots level, for it is only through such persistence that a positive change against male-dominated culture can occur within the construction industry. Besides this issue of male dominion, the biological perspective suggests that women are said to have an interest in the industry only after making family commitments such as birthing children. As a result, women opt to sideline their professions in the top professional positions (Mpemba, 2019).

Research shows that the selection of male candidates over female candidates by recruitment agencies is a noticeable trend in employment procedures. This employment procedure seems to be biased, although female employees may be more competent or fitting for these positions than their male counterparts (Arenas-molina and Rodr, 2016). Fasina *et al.* (2015) contend that the long-term effects and trends have birthed an issue of women's rights within the construction industry, which otherwise would be economically effective as it is acceptable to attract and attain more women than men within the industry.

2.2 Influence of digitalisation

According to The Organisation for Economic Co-operation and Development (2017), job activities are either automated offshore, or a combination of routine occupations at the biggest risk of job loss and the creation of high and low skills employment. Research indicates that men as opposed to women are more likely to lose their jobs to automation and digitalisation (McKinsey Global Institute, 2019). McKinsey Global Institute (2019) suggest that whether men or women are at a higher risk of job loss during the process of automation, females continue to be employed in lower-paying positions, and men will possess 'frontier' jobs in the future generation of automation.

2.3 Digitalisation and automation creating flexibility within the workplace

According to Aboagye-Nimo *et al.* (2019), there is a need to improve five key areas to enchant and retain women currently within the construction industry. These areas include: resisting work methodologies and processes to enchant flexibility within the work environment through digitalisation; improving caregiving systems in the work environment to support women's working dynamics; improving re-hiring of women employees as they also possess high skills and useful knowledge that are beneficial to the organisation; creating and improving a healthy organisational culture and reinforcing authority, and maintaining ties with past (and intermitting) employees. It is observed that women have resorted to leaving their jobs or planning their annual leave to use as maternity leave due to inequality within their workplace and the issue of statutory maternity pay that is not implemented at work (Aboagye-Nimo *et al.*, 2019).

According to the Organisation for Economic Co-operation and Development (2017), adopting a digitalised approach to employment can facilitate and allow work delegation and scheduling remotely. This approach serves to enchant the work-life balance of women employees, thereby removing the stigma of demanding careers within the construction industry. The government's intervention through amending the Basic Conditions of Employment Act No. 75 of 1997 can significantly assist and promote women's flexibility in the workplace. The amendment can assist in the following ways:

- to accommodate digital and automation working conditions of female employees,
- grant all employees the right to request flexible working time arrangements,
- re-evaluate the gender pay gap,
- encourage social partners to cover flexible workplace practices in collective bargaining arrangements,
- help companies change their work organisation through the exchange of best practices and information campaigns, and
- promote a change in the workplace culture (The Organisation for Economic Co-operation and Development, 2017).

2.4 Benefits of digitalisation in the construction industry

The use of digitalisation in the construction industry promises the following benefits.

2.4.1 Optimised efficiency and productivity

The growth of innovations through automation and the world's immoderate transformation of AI technologies, will help increase productivity across businesses. Routine manual labour is being slowly transitioned by robotics and computerised systems capable of accomplishing work that requires cognitive abilities (Mckinsey Global Institute, 2019).

According to Meno (2020), adopting new technologies such as BIM, mobile technology, AI, and cloud computing positively affects productivity and can revolutionise and revitalise the sector (Hudson, 2017). Armstrong and Gilge (2016) reiterate this view and state that the use of mobile devices to view building model stimulations has increased the level of digital stimulations and visualisation. Digital tools, therefore, optimise the construction industry's efficiency and productivity.

2.4.2 Reducing overall costs

Research has shown that adopting digitalised mechanisms such as robots, automation, and reproduction can positively influence the construction industry and reduce overall costs (Kamarunddi, 2015; Perkinsons and Ahmad, 2006). Furthermore, using automation to improve construction programmes will reduce costs relative to time-based preliminaries (Meno, 2020).

2.4.3 Added value to clients and stakeholders

The use of digitalisation in the construction industry can also have the benefit of providing improved quality and added value to both clients and stakeholders. This is because digital technology and computer systems have facilitated the illustration of construction designs and enable engineers and other designers to offer their clients an increased range of design options (Reffat, 2008).

2.4.4 Improved communication and collaboration

Digitalisation facilitates effective collaboration in the workplace for ad-hoc decision-making of projects that are less prone to rework, with quick data accessibility for project monitoring and progress tracking (Hudson 2017; Perkinsons and Ahamd, 2006).

2.4.5 Better use of human resources and enhanced service delivery

The lack of women's interest in the construction industry has resulted in a shortage of skills. However, digitalisation has the benefit of replacing human-executed tasks, potentially eliminating the need for certain human resources (Hudson, 2017). On the other hand, digitalisation can potentially ensure and promote the globalisation of the construction industry. Hence, digital technology is crucial to boost competitive advantage in the construction market (Kamaruddin, 2015).

2.4.6 Ability to work remotely

Digital tools allow work-related information to be stored in a cloud for easy accessibility and usage (Alaghbandrad, 2011). This ability to work remotely can motivate and enchant women to be interested in the construction industry.

According to the Organisation for Economic Co-operation and Development (2017), adopting a digitalised approach to employment can facilitate and allow work delegation and scheduling remotely. This approach serves to enchant the work-life balance of women employees, thereby removing the stigma of 'demanding' careers within the construction industry.

2.5 Challenges of digitalisation in the construction industry

Maskuriy et al. (2019) state that the South African construction industry is facing the challenge of implementing Industry 4.0. This challenge is attributed to small and medium-sized enterprises having a low capability to invest in using new technologies. Another reason is the subsequent increase in the number of manufacturing and supply chains enterprises in the country that cannot adopt new technologies or strategies of change and business strategy alignment (Maskuriy et al., 2019). Automation can create an expansion of economic opportunities. This expansion can help break barriers to women's involvement in the industry, thereby positively enabling their ability to navigate and transform the new digitised age of the

construction industry (McKinsey Global Institute, 2019). Equipping employees with new technological knowledge and advancement can be a more useful and practical way to mitigate the persistent reluctance and lack of adoption and implementation of Industry 4.0. According to Emmanuel (2018), this approach can encourage employees' creativity and enable government funding programmes to small and medium-sized enterprises.

2.6 Legislation

Mpemba (2019) posits that the objective of creating employment equity is to break potential hindrances in employment prospects faced by, among other things, South African women with the hope of empowering them to gain meaningful employment in the supposed male-dominated construction world. This need led to enacting the Employment Equity Act 55 of 1998. On the other hand, Fasina *et al.* (2015) claim that even though legislation and policies exist, implementation is close to non-existent and this is concerning, considering that women continue to be disadvantaged by these policies (The Organisation for Economic Co-operation and Development, 2017). However, Osunsanmi *et al.* (2020) argue that significant growth has occurred within the construction industry since the post-apartheid era, including the establishment of bodies such as the Construction Industry Development Board (cidb), which in a way advocates for and promotes the mainstreaming of South African women in the construction industry.

3 Research Methodology

A letter informing possible respondents regarding the online questionnaire was sent to Johannesburg and Pretoria-based construction managers, construction project managers, engineers, and quantity surveyors registered with the South African Council for the Project and Construction Management Professions (SACPCMP), the Engineering Council of South Africa (ECSA), and the South African Council for the Quantity Surveying Profession (SACQSP), respectively. Because of the large size of the selected sample populations, random sampling was used to select 200 registered persons.

The questionnaire consisted of 15 closed-ended questions. Five questions concentrated on demographics and ten questions were Likert scale questions. 31 responses were included in analysis of the data, which included the computation of frequencies and a measure of central tendency in the form of a mean score (MS) to enable interpretation of percentage responses to the Likert scale questions. The 31 responses equate to a response rate of 15.5%. A low response rate can lead to estimates of prevalence that are skewed by selective non-response. That is, the likelihood of someone taking part in the survey could be linked to the parameter being measured.

4 Findings and Discussion

In terms of discipline, 54.8% of the respondents were construction managers / construction project managers, 19.4% were quantity surveyors, 12.9% were architects, and a further 12.9% were engineers. 77.4% worked in the private sector, and 22.6% worked in the public sector. 61.3% of the respondents were male, and 38.7% were female. Regarding highest qualification, 38.7% of respondents had a bachelor's degree, 32.3% an Honours degree, 22.6% a Master's

degree, and 6.4% a diploma. In terms of years experience as a registered professional, 45.2% respondents had < 3 years of experience, 29.0% had 3 to 5 years, 16.1% had 6 to 10 years, 3.2% had 11 to 15 years, and 6.5% had > 15 years.

Regarding underrepresentation of women within the construction industry, respondents were required to respond relative to four reasons presented. 54.8% identified the patriarchal nature of the industry, 25.8% that the profession is threatening to one's work-life balance, 9.7% that women lack interest in the professions, and a further 9.7% that women lack exposure to the construction industry.

Respondents were required to indicate the frequency at which digitalisation occurs in their organisations on a scale of never to daily. The resultant mean score (MS) of 2.96 based on the percentage responses to the scale indicates the frequency can be deemed to be between monthly to fortnightly / fortnightly.

Respondents were also required to indicate the frequency at which they use digitalisation within their organisations on a scale of never to daily. The resultant MS of 3.10 based on the percentage responses to the scale indicates the frequency can be deemed to be between monthly to fortnightly / fortnightly.

The respondents were asked whether a digitalised and automated organisation using 4D drawings or drone systems creates flexibility and mobility within the organisation. 100.0% responded in the affirmative.

The respondents were also asked whether a digitalised workplace using 4D drawings or drone systems creates flexibility and mobility for them as professionals. 93.5% responded in the affirmative, and 6.5% were unsure.

Respondents were then asked if they think the construction industry should one day abolish traditional methodologies and techniques. 71.0% responded in the negative, 16.1% in the affirmative, and 12.9% were unsure.

5 Conclusions

Given the sample size and the response rate, the findings can be deemed indicative as opposed to representative. However, they indicate that there is a need to conduct an in-depth related study. The respondents identified the patriarchal nature of the industry as the predominating reason why women are underrepresented in the construction industry. This reason, along with the others identified, leads to the conclusion that gender inequality will prevail and continue for many years. Several findings allude to the potential role of digitalisation in terms of enabling enhanced participation by women, in addition to confirming the low level of digitalisation in the construction industry. These include: the monthly to fortnightly / fortnightly occurrence of digitalisation in respondents' organisations; the monthly to fortnightly / fortnightly use of digitalisation by respondents in their organisations; the unanimous support for the contention that a digitalised and automated organisation using 4D drawings or drone systems would create flexibility and mobility within the respondents' organisations, and the near-unanimous support for the contention that a digitalised workplace

using 4D drawings or drone systems would create flexibility and mobility for the respondents as professionals.

6 Recommendations

The construction industry should intensify endeavours to increase the representativity of females therein. Digitalisation should be used to enchant and retain women in the construction industry. Potential female students and aspiring female built environment graduates should be educated and made aware of the range of careers in the construction industry and the introduction of digitalisation therein. There are a range of careers within contracting organisations in addition to site and contracts management, and then the likelihood of new careers due to digitalisation. Furthermore, there are a range of non-contracting careers, which are not necessarily highlighted, which are likely to be digitalised. Also, the construction industry should be recognised for what it has become and its potential to evolve into an attractive industry to both females and males.

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