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THE LEAKY PIPELINE BETWEEN CONSTRUCTION EDUCATION AND WOMEN IN THE CONSTRUCTION INDUSTRY

Yolanda Moraba[1] and Oluwayomi Babatunde[2]
[1,2]School of Construction, Economics, and Management, Wits University, South Africa

For many years, a critical area of concern within South Africa's built environment has been the untransformed nature and the persistent underrepresentation of women within it. At the university level, the number of females registering in the faculty of the Built Environment has experienced a steady increase over the years. This increase, however, is not reflected in the built environment's workplace despite the increase in the graduation of female students. This study investigates the career decisions made by graduating female students based on their perceptions of the built environment, and how their long-term decision affects the underrepresentation of women therein. The study uses an online questionnaire designed from the career construction theory and the leaky bucket theory, which was distributed to female students registered for BSc Honours in Quantity Surveying and Construction Management at a university in South Africa. Interviews with recent graduates in the same field were conducted. The findings from the study report on the factors that motivated female students to study a construction-related degree, the challenges experienced during their studies, and how the experienced challenges influence their long-term career decisions within the construction industry. Graduating female students remain a wasted and an untapped resource within the built environment. If the built environment continuously fails to attract and retain graduating female students, it will face a skills shortage within the industry.

Keywords: barriers, career decisions, construction education, factors, female postgraduates

INTRODUCTION

For many years, a critical area of concern within South Africa's construction industry has been the untransformed nature and the persistent underrepresentation of women within it. This has remained unchanged for decades in many countries (Adogbo, Ibrahim & Ibrahim 2015; Madikizela & Haupt 2010; Del Puerto et al., 2011) even with interventions from the private and public sectors to reduce it. The characteristic of the construction industry is that it is male favoured with the lack of presence of females, especially in top influential positions (Martin & Barnard

[1] mmanoko.moraba@students.wits.ac.za
[2] oluwayomi.babatunde@wits.ac.za

2013). The traditions, organizational cultures and sexist attitudes that exist within the industry play a role when employing females in the industry (Sewalk & Netfield 2013; Madikizela & Haupt 2010). As a result, females currently employed in the construction industry are found more in administrative roles because the industry regards them as not suitable for the technical roles (Agherdien & Smallwood 2013; Sewalk & Netfield 2013).

Over the years, the number of female students registering and graduating from university's construction education programs have been experiencing a steady increase (Fielden et al., 2014; Powell et al., 2005). This increase, however, is not reflected in the industry's workplace (Fernando et al., 2014). This creates an imbalance between the number of female students in university and the number of women in the industry, which suggests that there is a leaky pipeline between universities and the construction industry.

At university, the career decisions of female graduates are influenced by the factors that act as barriers within construction (Ling and Poh, 2004). Decisions of graduating female students in construction-related degree programs are said to be influenced by the limitations found in the industry (Ling and Poh, 2004). Some of the limitations include the perceived unsafe nature of construction, challenging labour requirements and the dangerous work environment when deciding to enter the construction industry (Ling and Poh, 2004). In addition to these limitations, the general environment of the workforce of construction industries is that the majority of the labour force is male (Aulin and Jigmond, 2011), which creates an environment full of gender-based discrimination (Agherdien and Smallwood, 2013).

Studies by Bowen et al., (2013); English & Hay, (2015); and Yokwana, (2015) on the under-representation of females in construction have not sufficiently addressed the issues facing graduating female students from a South African context. The long-term career decisions of graduating female students and the impact the decisions of the graduating female students have on the under-representation of females in the workplace is thus a critical topic that requires thorough investigation. This study explores factors and barriers influencing the career decisions of graduating female students in South Africa's construction education programs, and how these factors and barriers affect their long-term career decisions within the construction industry. The study seeks to provide insight into factors that inspired construction education, barriers faced during construction education and the effect their decision have on the underrepresentation of women in South Africa's construction industry.

LITERATURE REVIEW

Factors motivating construction education

Career paths are usually decided on towards the final years of a person's high school career (Madikizela & Haupt 2010). However, Bigelow et al., (2016) report that the career-decision making process is often complicated for high school students and more than 80% of students in university believe that they made their career decision too early, with some reporting that they would change careers given a chance.

Of the students that choose to study a construction-related degree, the factors that have been identified as influential to female high school students' career decision include the poor image of the construction industry (Bigelow et al., 2017), the impacts of family members, friends, teachers, and counsellors have an influence on female student's perceptions of the construction industry and serve as motivating factors in female students pursuing careers within the industry (OstadaliMakhmalbaf 2014).

More factors that enhance the retention of female students include having a family member in the industry, mentoring, fellowships, scholarships, internships, career opportunities available to them after graduation and industry experience, which are likely to be enhanced if the relationship between universities and the industry is kept alive (Bigelow et al., 2016).

Internal barriers

While females are more likely to finish their degree as compared to males (Del Puerto, Guggemos & Shane 2011), and the increase in female enrolment in construction related degrees (Adogbo et al., 2015; Fielden et al., 2000; Morganson, Jones & Major 2010), underrepresentation of women within the construction industry still perpetuates. However, during their construction-related education, female students are faced with barriers that are regarded as internal barriers in this study.

These barriers have been found to be the lack of networking opportunities for graduating female students to meet and interact with other female professionals in the QS profession (Bigelow et al., 2017; Shane et al., 2012), male-dominated learning environments in the classrooms and dominated male academic staff (Adogbo et al., 2015; Shane et al., 2012). Female students have also reported the male culture that exists in classrooms (Ling & Poh, 2004) which often results in gender-based discrimination and harassment against graduating female students, from their male colleagues (Francis & Prosser 2014; Madikizela & Haupt 2010). This is said to be resulting from the fact that graduating female students are not readily accepted by their male colleagues (Ling & Poh, 2004).

As a result, female students preferred careers in other sectors such as health, commerce and IT over construction because of the barriers they have faced during construction education (Madikizela & Haupt 2010). Since the industry is facing a skills shortage, more effort needs to be made to retain the current pool of female students in construction education (Shane et al., 2012).

External barriers

External barriers are the factors that have been in the industry for many generations which graduating female students have no control over (Ling & Poh, 2004). The nature of the construction industry, working conditions, and sexist attitudes have been identified by (Ling & Poh, 2004) as external barriers graduating female students face in the construction industry. These barriers may be the primary source of the low participation rates we see of women in South Africa's construction industry (Fernando et al., 2014).

The nature of the construction industry is that it has an image that has been built over decades of male dominance (Ginige et al., 2013; Madikizela & Haupt, 2010;

Sewalk & Neitfeld, 2013), with difficult working conditions (Fernando et al., 2014). The construction industry, regarded as an "all-boys club", is a place which expects employees to work long hours, neglecting their family responsibilities in the process (Astor et al., 2017). The consequence of this model is that women who chose to work and have a family are prejudiced against (Astor et al., 2017). These women face sexist attitudes that include gender stereotypes and glass ceiling. Women are further faced with isolation and limited access to mentorship, which may help move up the organisation's ladder, because of the male-dominated organisational culture that exists (Agherdien & Smallwood, 2013).

The Career Construction Theory

The career construction theory addresses how individuals choose their career path based on personal and social constructivism (Savisckas, 2005). It involves career planning, decision making and the exploration of careers, which provides researchers with a way of conceptualizing the way people choose their careers. The career construction theory examines the process of psychosocial adaptation, how individuals cope with vocational development tasks, occupational transitions and work traumas (Savisckas, 2005). The interpretive and interpersonal processes through which people impose meaning and direction is explained, and the factors that impact the career choices of people are explored by the theory. The use of the theory will aid this study in examining the factors that motivated graduating female student to join the construction industry and how their long-term career decision within the industry influences the under-representation of females in South Africa's construction industry.

The Leaky Bucket Theory

The leaky bucket theory was developed by Ehrenberg (1988) to explain the process of customer gain, loss and retention in the marketing field. In the Science, Technology, Engineering and Mathematics (STEM) fields, the term "leaky pipeline" is often used to describe the leaky pipeline that carries female students from high school, through university into the construction industry (Blickenstoff, 2005).

Using the career construction theory, Skorikov (2007) reported that individuals plan for their careers during their adolescent years and develops right through to adulthood. In between the process, people are continuously preparing for and adapting to their careers, and as the adaptation process occurs, it can result in a different career decision than the one chosen during adolescent due to the perceived challenging work environment (Skorikov, 2007). This suggests that the career construction theory comes into play before the leaky bucket theory. The career construction theory explains the pipeline while the leaky bucket theory explains the leak along the pipeline.

Fielden et al., (2014) reported that there has been an increase in the number of female students registering and graduating from universities. However, this increase has not being reflected in the demographics of the industry's workplace. The leaky bucket theory describes this occurrence as a syndrome where universities are constantly graduating an increased number of female students and releasing them into a system that is leaking. As a result, the underrepresentation of women within the construction industry persists despite the increase in the number of graduations of female students.

Ling & Poh, (2004) suggest that graduating female students make their long-term career decisions based on internal barriers faced during construction education and the perceived external barriers found in the construction industry. It can be argued that the leak is caused by the cumulative effect of the barriers graduating female students face, resulting in the imbalance found between female students in university and in the construction industry. This theory will be used to establish the reason for the imbalance in the number of female students in university and the number of females in the construction industry.

PROBLEM STATEMENT

The under-representation of females in South Africa's construction industry is dependent on the experiences of the graduating female students during the course of their construction-related studies, which affects their perceptions of the construction industry and, as a result, their long-term career decisions.

Conceptual Framework

Figure 1 presents the relationship between the early days when female students start deciding on the career path they want to pursue. After high school, female students either register for a construction-related degree or a non construction-related degree. For those that register for a construction-related degree, their decision to pursue a career in the construction industry has been found to be influenced by the media, career opportunities available upon graduation, perceived financial stability, family, friends and mentors. The circle represents female students' duration as undergraduate students at a university in South Africa. During their undergraduate studies, female students have reported being faced with challenges that were identified broadly by Ling & Poh, (2004) as internal and external barriers. Despite having faced barriers during their undergraduate years, some female students decide to continue with their studies by enrolling for a postgraduate degree. Those that decide not to join the industry cause the leaky bucket phenomenon. This leak further perpetuates the underrepresentation of women South Africa's construction industry is facing.

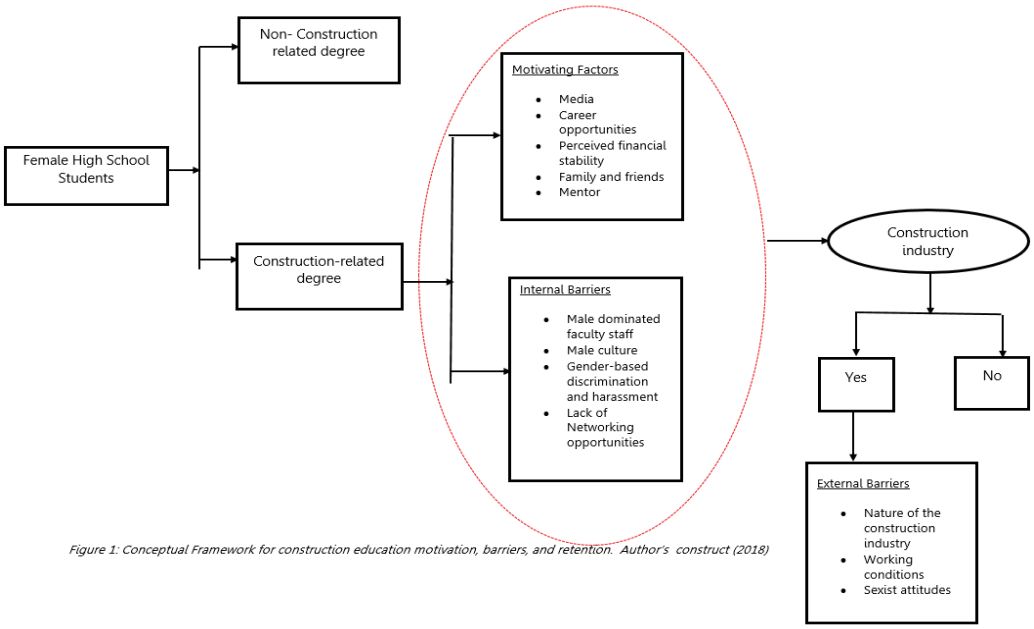

Figure 1: Conceptual Framework for construction education motivation, barriers, and retention. Author's construct (2018)

RESEARCH DESIGN AND METHODS

This study is an extension of a pilot study which used questionnaires to collect data. The pilot study investigated factors that motivated graduating female students to join the construction industry and how their long-term career decision within the industry influences the underrepresentation of women in South Africa's construction industry. The online questionnaire was adapted from previous studies by Ling & Poh, (2004), the career construction theory and the leaky bucket theory. The study used a five-point Likert scale where respondents were asked to rate statements in Table 1.

The questionnaire was distributed to 15 female students registered for BSc Honours (Quantity Surveying) and BSc Honours (Construction Management) at a university in South Africa, and 15 useable questionnaires were returned. The convenience sampling technique was used in this study. The sample was chosen because BSc Honours students have industry experience; thus, they have a better understanding of the scope and nature of construction education, training, and South Africa's construction industry. Furthermore, the Honours year is the exist point for the CM and QS degree thus, the participants are currently at a stage where they are making their long-term career decision. Interviews were conducted with BSc Honours (Quantity Surveying) and BSc Honours (Construction Management) graduates who have recently joined the construction industry. The sampling techniques used for the interviews were the convenience and the snowball sampling techniques. The interview questions were developed using the career construction theory and the leaky bucket theory.

The table below provides a profile of this study's participants. A summary of the results is presented below and will be discussed in the subsequent sections.

Age (years)				
	18 - 24	25 - 35	36 - 45	46 +
BSc Hons (QS) female student	9	1	0	0
BSc Hons (CM) female student	5	0	0	0
BSc Hons (QS) graduate	0	3	0	0
BSc Hons (CM) graduate	1	1	0	0
Industry Experience				
	Vac work (during studies)	Part-time (during studies)	0 – 2 years	3 – 5 years
BSc Hons (QS) female student	8	2	0	0
BSc Hons (CM) female student	4	1	0	0
BSc Hons (QS) graduate	0	0	3	0
BSc Hons (CM) graduate	0	0	1	1

Table 1: Summary of results

Barriers/ Factors		Mean	Median	SD
Factors motivating construction education				
F1	Career opportunities available	4.00	3.60	3.32
F2	Prospective financial stability	4.00	3.60	3.82
F3	Image of the construction industry	3.67	1.50	3.66
F4	Family, friends and teachers	3.67	1.50	3.82
F5	Mentor and high school career counsellors	3.11	4.00	3.60
F6	Media	2.56	4.60	3.31
F7	Having a father in the industry	2.00	1.50	2.23
Internal barriers				
I1	Male-Dominated faculty staff and lecturers	4.44	2.00	3.19
I2	Male culture exists in construction education	4.00	3.60	3.20
I3	Discrimination against female students	3.67	3.00	2.93
I4	Lack of Networking Opportunities	3.33	3.00	3.49
I5	Female students face gender-based harassment in construction education	3.33	3.00	3.31
I6	Female students are not readily accepted by their male counterparts	3.11	4.00	3.31
External barriers				
E1	Construction jobs are masculine	4.33	1.50	3.82
E2	Construction jobs occur at the expense of family responsibilities	4.22	1.00	3.60
E3	Gender stereotyping occurs in the construction industry	4.11	0.50	3.88
E4	Construction jobs have long working hours	3.89	1.00	3.31
E5	Male cultures exist in construction	3.89	2.00	2.23
E6	The construction industry has a poor image which deters graduating female students from entering the construction industry	3.89	0.50	3.66
E7	Female graduating students face glass ceiling	3.56	0.50	3.38

The results show that graduating female students construct their career paths based on the perceptions they have of the construction industry. The results also show that career opportunities available, prospective financial stability and the image the industry has. The influence of mentors, the media and family members played a major role in the decision-making process. This supports the career construction theory in that individuals choose a career path based on personal and social constructivism, imposing meaning on factors reported in F1 to F7 (Savickas et al., 2005). The lack of female lecturers was reported to be the major barrier during construction education.

DISCUSSION

More networking opportunities were suggested to help graduating female students to find ways to deal with the barriers they face, and general career advice. Professional bodies and universities should put in more effort to educate high school students and the general public about careers in the construction industry and hold networking events for university students (Ling and Poh, 2004). The experiences graduating female students have during construction education shape the perceptions they have of the construction industry, prior to entering the industry. The career construction theory focuses on the role of people's experiences and the impact those experiences have on the career decisions they make (Savickas et al., 2005). According to the theory, the experiences graduating female students have during university will form a major part of how they construct their long-term

careers in the construction industry (Savickas et al., 2005). Factors reported in I1 to I6 report the male dominated nature of the industry, which forms a perception and reality that the industry is of male dominance.

Graduating female students still hold the poor, old image of the construction industry. The nature of the industry is seen as masculine, which requires long working hours. Ling and Poh (2004) suggests that this acts against female graduates' entry into the construction industry. The male culture and gender stereotyping that exists within the industry often subjects women to a slow career progression than their male counterparts. The experience in I1 and I6 contribute in forming the perceptions of the factors reported in E1 to E7. As a result, these external barriers contribute to the leaky bucket phenomenon where the industry cannot retain the increased number of female graduates. This suggests that the leaky point exists in the construction industry and is caused by the reported external barriers. This means that the construction industry cannot retain the increased number of female graduates' universities produces, causing the imbalance between the number of female students in universities and females in the construction industry.

The results of the pilot study were used to develop interview questions for the purpose of extending the study to establish the "leaky point" that creates the imbalance between the number of female students in university and the number of females found in the construction industry. The interviews were conducted with Quantity Surveying and Construction Management graduates from a university in South Africa who have been working in the construction industry for 2-3 years.

Construction Education Motivation

The interviews outlined the key factors that motivate graduating female students to pursue a construction related career path.

Respondent 1*: "I applied for a Bachelor of Architecture, but I was rejected. Quantity Surveying was my third choice of study."*

Respondent 2*: "Watching TV shows about refurbishing houses and turning around properties intrigued my interest to join the construction industry. The shows fascinated me, and I wanted to be part of that process."*

Respondent 3*: "In high school, I job shadowed my uncle who was an executive at a consulting firm."*

The Career Construction Theory emphasizes that individuals choose their career path based on personal and social constructivism (Savickas et al., 2018). The result show that the respondents created a career path suitable for them by imposing meaning on the external factors they see in their immediate society (Savickas et al., 2012). The media also has an impact on the image it portrays about the industry, with the positive image influencing high school learners to enter the industry and pursue careers. It is of importance to note that some graduates report that the construction industry was not their initial choice of study, which may explain the leaky phenomenon we experience.

Internal Barriers

Respondent 1*: "The challenge I faced was not having female mentors who occupy executive positions in the industry, which is unfortunate"*

Respondent 2*: "During my undergraduate and post-graduate studies, my class was female dominant. I, therefore, did not experience any gender-based challenges. The only challenges I faced were the regular challenges every student face, regardless of the degree they are enrolled in."*

Respondent 3*: "The only challenge I faced at university is working in groups because I personally don't like working in groups. There was no gender division of activities in class. The girls and boys were treated the same way. However, the academic staff was male-dominated. I guess it reflects the current state of the industry in terms of representation"*

The career construction theory focusses on the role people's experiences play and the social expectations of those experiences play regarding the way people prepare for, enter and participate in the work environment (Savickas et al., 2012). The experiences female graduates experienced during construction education suggest that the leaky point does not lie within the construction education system.

External Barriers

Respondent 1*: "I've only started working 2 years ago but I can already see my ceiling. The industry is very sexist and male-dominant. Women face a lot of challenges and the sexism that exists in the industry can make one resent every moment. For me, this is currently just a job that helps pay my bills. I'm looking to leave and pursue something else in the health field."*

Respondent 2*: "Certain opportunities are afforded to male employees only. It does not matter how good you are at your job as a female. I've been doing admin work such as writing minutes while my male colleagues that I graduated with get to head projects of their own. It's demoralizing because even if you work twice as hard, you are overlooked for promotions and better job prospects as a female."*

Respondent 3*: "I was often judged based on the number of hours I spent at work, and not the quality of work I produced. It is hard and discouraging to work in an industry with a few women in management positions. I could see that my growth would be limited. The glass ceiling is visible in the construction industry."*

The transition from university to the work place is often challenging for graduates. This result in them creating self-regulation capabilities to help them cope with the transition and work traumas (Savickas et al., 2018). When their coping mechanisms do not work, graduates often consider exit strategies (Savickas et al., 2018).

CONCLUSION AND RECOMMENDATION

Graduates have reported that they have experienced external barriers in the industry which cause them to consider leaving the industry. This is after spending at least 6 years of training both in university and in the industry. Although the number of female students registering from and graduating from university's faculty of the built environment have been experiencing an increase, this has not

been reflected in the industry's work environment. This imbalance shows that there is a leaky bucket phenomenon that exists within the construction industry. To solve the problem of underrepresentation of women in the construction industry which has perpetuated over decades, the industry needs to improve on its image to attract more graduating female students. Female mentors need to be established to provide graduating female students with role models. Further, construction companies should establish target initiatives inhouse such as support programmes that challenge the cultural norms and gender stereotypes found in the company. This will allow for internal audits on a large scale. Furthermore, this will ensure that we limit the leaky bucket phenomenon that the industry is currently experiencing. If the industry fails to do this, the skills shortage in the industry will result in a slow economic and infrastructural development of the country. South Africa's construction industry and universities, therefore, need to transform and diversify so that it can sustain its business development and growth.

REFERENCES

Adogbo, K, Ibrahim, A, and Ibrahim, Y (2015) Development of a Framework for Attracting and Retaining Women in Construction Practice. "Journal of Construction in Developing Countries", 20(1), 99–115.

Agherdien, S and Smallwood, J (2013) Women in South African Construction, In: Kajewski, S (Ed.), Manley, K (Ed.) and Hampson, K (Ed.) "Proceedings of the 19th CIB World Building Congress, Brisbane 2013: Construction and Society" 5-9 May 2013, Brisbane, Australia, Queensland University of Technology, 1-11.

Ayalp, G and Öcal, M (2016) Determining Construction Management Education Qualifications and the Effects of Construction Management Education Deficiencies on Turkish Construction. "Creative Education", 7(1), 254-268

Aulin, R, and Jingmond, M (2010) Issues confronting women participation in the construction industry. In Mwakali, J (Ed.), Alinaitwe, H (Ed.), "Advances in Engineering and Technology- Contribution of Scientific Research in Development", Makere University, Uganda Entebbe, 312-318.

Bigelow, B F, Bilbo, D, Ritter, L, Mathew, M and Elliott, J W (2016) An evaluation of factors for retaining female students in construction management programs. "International Journal of Construction Education and Research", 12(1), 18-36.

Bigelow, B F, Saseendran, A and Elliot, J W (2017) Attracting students to construction education programs: An exploration of perceptions by gender. "International Journal of Construction Education and Research", 14(3), 179-197.

Del Puerto, C, Guggemos, A C and Shane, J S (2011) Exploration of strategies for attracting and retaining female construction management students. "In 47th ASC Annual International Conference Proceedings", Lincoln, Nebraska, 6-9.

Fernando, N G, Amaratunga, D and Haigh, R (2014) The career advancement of the professional women in the UK construction industry: The career success factors. "Journal of Engineering, Design and Technology", 12(1), 53-70.

Fielden, S L, Davidson, M J, Gale, A and Davey, C L (2001) Women, equality, and construction. "Journal of Management Development", 20(4), 293-305.

Francis, V, and Prosser, A (2014) Exploring vocational guidance and gender in construction. "International Journal of Construction Education and Research", 10(1), 39-57.

Ginige, K, Amaratunga, R D G and Haigh, R P (2007) Effect of attitudes towards creating women managers in the construction industry. "Research Institute for the Built Environment, University of Salford", 169-179.

Kolade, O and Kehinde, O (2013) Glass ceiling and Women career advancement: evidence from the Nigerian construction industry. "Iranian Journal of Management Studies", 6(1), 79-99.

Ling Yean Yng, F and Pei Poh, Y (2004) Encouraging more female quantity surveying graduates to enter the construction industry in Singapore. "Women in Management Review", 19(8), 431-436.

Madikizela, K, and Haupt, T (2010) Influences on women's choices of careers in construction: A South African study. "Construction Economics and Building", 10(1), 1-15.

Martin, P, and Barnard, A (2013) The experience of women in male-dominated occupations: A constructivist grounded theory inquiry. "SA Journal of Industrial Psychology", 39(2), 1-12.

Moraba, M Y and Babatunde, O (2018) Graduating Female Students' Long-Term Career Decisions and Underrepresentation of Women in South Africa's Construction Industry. In: Root, D and Khatleli, N (Eds). SACQSP 10th International Research Conference, 31 September 2018 – 01 October 2018, Johannesburg, South Africa, pp 67 – 76

Morganson, V J, Jones, M P and Major, D A (2010) Understanding Women's Underrepresentation in Science, Technology, Engineering, and Mathematics: The Role of Social Coping. "The Career Development Quarterly", 59(1), 169-179.

OstadaliMakhmalbaf, M (2014) Identifying and Prioritizing the Fundamental Factors that Lead to Inaccurate Perceptions of the Construction Industry. Master's thesis, Texas A & M University.

Savickas, M L and Porfeli, E J (2012) "Career Adapt-abilities scale: Construction, reliability, and measurement equivalence across 13 countries", Journal of vocational behaviour.

Savickas, M L, Porfeli, E J, Hilton, T L, and Savickas, S (2018) The Student Career Construction Inventory. "Journal of Vocational Behavior", 106(1), 138-152

Sewalk, S and Nietfeld, K (2013) Barriers Preventing Women from Enrolling in Construction Management Programs. "International Journal of Construction Education and Research", 9(4), 239-255.

Shane, J, del Puerto C L, Strong, K, Mauro, K, Wiley-Jones, R (2012) Retaining Women students in a construction engineering undergraduate program by balancing integration and identity in student communities, "International Journal of Construction Education and Research".