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# BARRIERS TO THE PROFESSIONAL DEVELOPMENT OF QUALIFIED WOMEN IN THE PERUVIAN CONSTRUCTION INDUSTRY

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## ABSTRACT

The construction industry frequently offers an unwelcoming environment for women, and those who do manage to enter have high rates of turnover and abandonment. Within this scenario, this research aims to identify the barriers faced by qualified women, to analyze the different views that qualified men and women have regarding these barriers, and to find the underlying factors that group these barriers and their degrees of importance. In the context of this research, "qualified" men and women are those who hold a university degree (in construction-related areas). Initially, 20 barriers were identified analyzing previous contributions. These barriers composed the statements of the questionnaire survey; data was obtained from 429 professionals of the Peruvian construction industry. It was found that women face invisible barriers throughout their careers and have fewer professional opportunities than men. The main perceptual dissimilarities between men and women indicate that men interpret womanhood as a form of positive discrimination which, far from being a professional barrier, is considered by them as an advantage. Likewise, women agree that if they take maternity leave, they will suffer a loss in the hierarchical order; furthermore, the

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industry does not have flexible work schedules, childcare programs, or provisions for career breaks. Five underlying factors were extracted from the analysis: “male oriented labor market”, “detrimental issues for being a woman”, “harsh working conditions in the construction industry”, “unfavorable perception of the construction industry”, and “high competitiveness of the construction industry”.

**KEYWORDS:** Women; Barriers; Construction Industry; Qualified Professionals; Peru.

## INTRODUCTION

Occupational segregation by gender exists in almost all organizations and in all professions where men receive higher pay and occupy more prestigious positions (Anker 1997; Blackburn et al. 2002). Occupational segregation imposes limitations on the careers of women, who have lower salaries, less authority, and fewer opportunities for promotion and career mobility (Charles 2003; French and Strachan 2015; Wright 2015). This segregation can be horizontal or vertical (Anker 1997; Blackburn et al. 2002; Charles 2003). Horizontal segregation occurs when there is a predominance of one gender in certain sectors. Vertical segregation involves the unequal distribution of men and women in the hierarchy: women are employed in a reduced number of work posts and their presence is very scarce in others.

When focusing on construction, the sector offers a relatively inhospitable climate for women, where occupational segregation by gender exists, both horizontal and vertical (Fielden et al. 2000; Dainty and Lingard 2006; French and Strachan 2015). In spite of the efforts of many countries to introduce equal employment regulations and acts (Galea et al. 2015; Wright 2015), and the increasing number of women participating in the construction sector (Dainty

and Lingard 2006; Malone et al. 2014), women still face many challenges in a scenario dominated by masculine culture (Galea et al. 2015; Powell and Sang 2015; Wright 2015). The concern shared by many researchers is to identify the barriers that women face throughout their working lives, not only to enter the field, but also to develop professionally in the construction sector; from the point of view of this research, a barrier is a set of circumstances, impediments or obstacles that prevents progress. This has been the focus of several studies carried out in the United States (Bilbo et al. 2014; Denissen and Saguy 2014; Malone et al. 2014), the United Kingdom (Dainty et al. 2000b; Fielden et al. 2000; Dainty and Lingard 2006; Ness 2012; Fernando et al. 2014; Powell and Sang 2015), the European Union (Byrne et al. 2005), Australia (Lingard and Lin 2004; Dainty and Lingard 2006; French and Strachan 2015; Galea et al. 2015), Singapore (Ling and Poh 2004), South Africa (Madikizela and Haupt 2010; English and Le Jeune 2012), Nigeria (Kehinde and Okoli 2004; Adeyemi et al. 2006), Tanzania (Sospeter et al. 2014), Bangladesh (Hossain and Kusakabe 2005; Choudhury 2013), Thailand (Kaewsri and Tonghong 2011), Malaysia (Jaafar et al. 2014), among others.

No studies have been found so far regarding the Peruvian construction industry, where the female labor force representation is 4.1% of the total workers (developed from MTPE 2016), whereas for the whole economy, women comprised 44.9% of the workforce in 2010 (World Bank 2016). Data obtained from the Institute of Engineers in Peru (2014) shows that women represent 13.7% of the civil engineering profession (CIP 2016). Peruvian figures regarding female participation are not so different from those of the United States (2010): 46.2% for the total economy (World Bank 2016), 2.7% for construction trades and 11.0% for managers and professionals (developed from BLS 2016). Moreover, the Peruvian Gross Domestic Product for construction was 6.8% of the total in 2014, having become a steady sector during the

previous five years (INIE 2016), with values similar to those of developed economies (Francis and Prosser 2014).

Furthermore, in the construction sector, human resources can be sorted into two different categories (Fielden et al. 2000; English and Le Jeune 2012): on the one hand, managers and professionals (mainly architects, engineers, and surveyors), as well as administrative and clerical staff; on the other hand, the construction trades. Several of the previous contributions have been focused on the industry as a whole (e.g., Fielden et al. 2000), whereas others have analyzed the role of managers and professionals (e.g., Bilbo et al. 2014), or more specifically the construction trades (e.g., Ness 2012). Some of these studies also point out that women tend to work in administrative and clerical jobs (Fielden et al. 2000; Byrne et al. 2005; English et al. 2012; Francis and Prosser 2014). Ness (2012) quantifies the workforce in building trades as 0.2–0.3% of the total in the United Kingdom. The number of females pursuing academic degrees in construction-related fields is growing gradually (Byrne et al. 2005, Dainty and Lingard 2006; Kaewsri and Tonghong 2014), but this fact has not yet been equally reflected in the percentage of female managers and professionals in the industry (Madikizela and Haupt 2010; Fernando et al. 2014). More women in managerial and professional work posts is a key step to guarantee higher levels of gender equality in the construction industry; therefore, analyzing further the role of qualified women in the construction sector is still a challenging issue worth researching. In the context of this research, “qualified women” are those who hold a university degree related to construction.

The research illustrated in this paper takes a holistic approach regarding the barriers that women face during their entry and advance in the construction industry; previous research has been focused on these issues from a narrowed focus, such as family-related factors (e.g. Bilbo

et al. 2014) or women's abilities (e.g. Ness 2012), or only partially, taking into consideration some of the potential barriers (e.g. Dainty and Lingard 2006). Considering this holistic approach, this paper has three goals: (1) to identify and confirm the barriers faced by qualified women; (2) to analyze the different views that qualified men and women have regarding these barriers; and (3) to find the underlying factors that group these barriers and their degrees of importance. As far as the authors are concerned, only Dainty et al. (2000b) analyzed the different views of men and women regarding this topic, using an ethnographic approach; moreover, none of these studies focused on obtaining the latent factors that group these barriers. Hence, regarding the first goal, this study could be considered confirmatory, but regarding the other two goals, this study introduces innovative approaches to the topic. Furthermore, although the context of research is the Peruvian construction industry, the initial barriers analyzed come from research carried out in different countries worldwide; therefore, conclusions can be drawn to decontextualize these findings for a more general audience, confirming or challenging these findings from other countries.

## RESEARCH METHOD

In order to accomplish the goals previously stated, the research team followed the process displayed in Figure 1. A preliminary literature review allowed the research team to establish the goals of the research. Then, a systematic literature search was performed in order to find out the main challenges and difficulties that women (not only qualified women) face during their entry and advance in the construction industry. They were sorted out into 20 barriers (variables) that were the basis for developing a questionnaire. Later, a survey was conducted administering the questionnaire to 429 qualified professionals in the Peruvian construction industry. Through a set of questions, these 20 variables were measured, presented as potential

barriers to the professional development of qualified women in the construction industry. The statistical analysis undertaken included not only the descriptive statistics, but also an independent sample t-test to compare the different perceptions of both genders regarding these barriers. Then, a principal component analysis was carried out to find the underlying factors (latent variables) to the professional development of qualified women in the construction industry; later, a regression analysis of these underlying factors was also developed to assess their influence. The research concluded with discussion of the findings, main contributions, and general recommendations to address these barriers, as well as future research to expand the body of knowledge on the topic.

<FIGURE 1>

## Identification of Barriers

The research team analyzed the main theories on gender segregation (Anker 1997). Later, a systematic search was performed focused on the construction industry; it was not only specifically related to female managers and professionals, but also to gender segregation in general. Applying thematic analysis (Braun and Clarke 2006) to these previous contributions, the team identified a potential list of difficulties and challenges that women face during their entry and advance in the construction industry. In a second step, they were sorted, summarized and condensed into barriers (variables) according to similar meanings using the affinity diagram technique (Carnevalli and Miguel 2008). Following this process, the authors identified 20 variables (barriers), which are displayed in Table 1. In the following paragraphs, these barriers are described and grounded into the contributions referenced in the right hand column of Table 1.

<TABLE 1 HERE>

The poor negative image of the construction industry means that many men and women are reluctant or have little interest in working in the sector (Bennett et al. 1999; Fielden et al. 2000; Ling and Poh 2004; Bilbo et al. 2014). The male dominated image and the masculine culture of the construction industry effectively deter women from entering it (Ling and Poh 2004; Denissen and Saguy 2014). Female construction professionals are few given the image of the engineering profession, a lack of knowledge among the general public of what engineering is, and a misguided emphasis on math and science by recruiters (Bilbo et al. 2014; Francis et al. 2014; Pellicer et al. 2014). The misconception that the construction industry involves only site activities considered hazardous, dangerous, difficult and unsuitable, continues to be the major barrier to female entry into the industry (Kehinde and Okoli 2004; Ness 2012; Kaewsri and Tonghong 2014). This is definitely a negative factor in the process of career choice for both men and women (Gale 1994; Ness 2012). The initial lack of knowledge about the reality of the sector as well as a change in expectations means young women become disillusioned with their career choice (Dainty et al. 2000a; b).

Furthermore, the construction workplace environment is generally competitive, conflictive, and plagued by discrimination against women (Gale 1994; Ling and Poh 2004; French and Strachan 2015). Women are overtly and covertly discriminated against by men, who can undermine their participation and achievements (Dainty et al. 2000a; Denissen and Saguy 2014; French and Strachan 2015). The industry is also known for its high levels of interpersonal and organizational conflict, being a predominantly masculine sector that is characterized by a macho culture based on animosity and aggression (Menches and Abraham

2007; Francis et al. 2014; Denissen and Saguy 2014), as well as a hostile work environment (Fielden et al. 2000; French and Strachan 2015). In addition, the industry has terms and conditions of employment that steer women away from the profession: brute force, high tolerance to outdoor conditions, adverse weather, foul language, and dirty sites (Agapiou 2002; English et al. 2012; Denissen and Saguy 2014). The sector is clearly dominated by men, and the male culture prevails (Dainty and Lingard 2006; English and Le Jeue 2012; Sospeter et al. 2014).

Several authors have discussed the conflict between work and home life (Agapiou 2002; Dainty and Lingard 2006; Bilbo et al. 2014). This is an on-going problem for women with professional aspirations because organizations tend to treat the family and work as completely independent factors (Fielden et al. 2000; Byrne et al. 2005; Bilbo et al. 2014). Women in the construction industry who expect to balance both family and career success may experience significant difficulties (Lingard and Lin 2004; Menches and Abraham 2007; English and Le Jeue 2012). Success is measured by traditionally masculine notions such as total commitment, and family and personal obligations are thus interpreted as distractions (Menches and Abraham 2007; Bilbo et al. 2014). Organizations are still structured and function in ways that do not always support women's career patterns and their struggle to integrate work with family demands (Lu and Sexton 2010; Malone et al. 2014). It is also recognized that the inability of women to cope, because of their roles as wives/mothers and the demands of their careers, is generally stressful for women (Kehinde and Okoli 2004; Lu and Sexton 2010; Bilbo et al. 2014).

The existence and persistence of glass ceilings in the professional development of women is a fact (Ling and Poh 2004; Hossain and Kusakabe 2005; Fernando et al. 2014) and the nature of

196 the sector sustains such mechanisms. Many times, these barriers begin in the recruitment
197 process where procedures follow androcentric criteria (Fielden et al. 2000; French and
198 Strachan 2015). In addition, the construction sector is plagued by sexual harassment at all
199 levels (Whittock 2002; Madikizela and Haupt 2010; Denissen and Saguy 2014), as well as
200 sexually discriminatory attitudes (Fielden et al. 2000; Kaewsri and Tonghong 2014; French
201 and Strachan 2015).
202
203 Furthermore, the access to top positions is often achieved through informal networks and
204 mentors (Lu and Sexton; Galea et al. 2015). Townley (1989) reported that women tend to lack
205 access to informal networks that provide information and links about these opportunities.
206 They are also less likely to have mentors who recognize their potential and provide the
207 necessary support to ensure success. In brief, women must adapt or they are discouraged,
208 excluded, and eventually expelled (Greed 2000; Galea et al. 2015).
209
210 In the construction industry, most of the jobs held by women are clerical and administrative
211 (Fielden et al. 2000; English et al. 2012; Francis and Prosser 2014) or technical (Fielden et al.
212 2000; Menches and Abraham 2007; Bilbo et al. 2014) in nature. Very few women work at the
213 operational level, and data on these women is scarce or nonexistent (Byrne et al. 2005; Ness
214 2012; Jaafar et al. 2014). That is, women entering the construction industry as professionals
215 tend to fill technical specialist positions rather than general management positions (Bennett et
216 al. 1999; Menches and Abraham 2007; Bilbo et al. 2014). It seems that the nature of
217 fieldwork is an overwhelming barrier for women (Byrne et al. 2005; Dainty and Lingard
218 2006; Ness 2012), and therefore women may lack the kind of work experience that leads to
219 career advancement (Arena et al. 2015; French and Strachan 2015). Interestingly though,
220 Choudhury (2013) states that sometimes male workers “envy” female workers because their

managers appear to prefer them over male workers; additionally, Cheung et al. (2016) assert that some women do try to influence their colleagues at work using specific job attitudes.

As shown, the topic of barriers that qualified women face in order to enter and advance in the construction industry is still under discussion by the scientific community; no definite conclusions have yet been drawn. Hence, this research summarizes the barriers previously proposed by other contributors (in an isolated or more specific way) in Table 1. They are the variables that are tested by the means of a survey to achieve the goals of this research.

**Survey**

The variables displayed in Table 1 were transformed into statements to measure the respondents' compliancy with each. The questionnaire was divided in four parts:

- Brief explanation of the research and its goals.
- Characterization of the respondents (13 questions): age, gender, marital status, number of children, plans to have more children, career priority, academic degrees, current work post, part time or full time, years of experience, subsector, number of workers in the organization, and professional associations.
- Research questions (20) that represent the variables to be analyzed, as enumerated in Table 1 (second column). To determine the influence of each of the 20 variables, the respondents were asked to express agreement or disagreement with the statements, attributing the relative importance of each with a 9-point Liker scale, being 1 "completely disagree" and 9 "completely agree".
- Additional comments from the respondents. These comments are later used as verbatim to enrich the discussion of results.

The questionnaire, designed to be answered in 20 minutes or less, was available on line supported by the software tool Google Drive. The diffusion of the survey was done through emails to members of the Peruvian Institutions of Civil Engineers or Architects, as well as social networks (such as LinkedIn and Facebook) linking the potential respondents to the on line questionnaire. To become a member of the Institutions of Civil Engineers or Architects, it is required to hold a bachelor degree issued by a university officially recognized by the Peruvian government.

The study population is composed of qualified professionals in the Peruvian construction industry, including Civil Engineers and Architects (both men and women). Even though, there is a lack of detailed statistical information about employment in the construction sector in Peru, the basic general figures are detailed next. The number of Civil Engineers registered in the Peruvian Association of Engineers is 41,770 (CIP, 2016). Gender distribution shows a large majority of male, having only 13.74% of female membership. More than half of the civil engineers' professional members have not more than ten years of experience in the industry, and 58.84% work for companies with less than 10 employees (INEI, 2016).

For statistical purposes it was considered that the population was infinite. The final sample (after deleting all the incomplete or defective responses) included 429 individuals; this means that the estimated error is 4.7% for a 95% confidence level. Data was analyzed using IBM SPSS Statistics (version 22.0). The statistical analysis undertaken provided results regarding (see Figure 1): (1) a descriptive statistics of the sample in order to achieve the first goal of this research; (2) a comparison between genders for the 20 items of the second part of the questionnaire in order to accomplish the second goal of this research; (3) a principal

component analysis (PCA) and a regression analysis in order to fulfill the third goal of this research. These results are summarized in the next section.

## RESULTS

### Statistical Characterization

According to their questionnaire responses, the majority of respondents were male (76%), under 40 years old (78%) with a mean age of 33, and single (63%). Regarding the professional characteristics of the sample, a large majority (62%) had less than 5 years of experience in the sector, and only 5% had more than 20 years of experience. Thirty per cent of the respondents worked in organizations with fewer than ten employees, while 23% worked in organizations with more than 200 employees; these organizations were mainly in the public (35%) and building (35%) sub-sectors. Job positions of the respondents were distributed in the following way: technical staff (48%), supervisors (23%), medium management (21%), and top management (8%). A relevant number of respondents (54%) were members of the Peruvian Institution of Civil Engineers, 8% members of the Peruvian Institution of Architects, and 38% did not have any professional membership (it is not mandatory in Peru). Considering the shortage of statistical information about employment in the Peruvian construction industry, the sample analyzed in this paper shows a basic concordance with the above mentioned characteristics of the population.

Regarding the descriptive results, the greatest agreement among respondents (in the sense expressed by the Likert scale) is found for the following variables: construction jobs are very competitive by nature (V3); construction industry does not have flexible work hours,

childcare programs or provisions for career breaks (V9); there is a masculine culture at work (V14); and women face sexual harassment at work (V15). Three variables were not considered as important for the respondents (mean bellow 5.0): construction industry has a bad image (V1); women have fewer career opportunities than men (V12); and women should adopt male attitudes to be accepted in the industry (V17).

**Differences between Genders**

The comparison of the different perceptions that both genders had for each of the 20 items of the second part of the questionnaire was performed using an independent sample t-test. The hypothesis of homoscedasticity (using Levene's test) between both sub-samples was checked for each of the 20 items: it was accepted in 12 of them, but rejected in eight of them. The result of this analysis is given in Table 2, including: means and standard deviations for the whole sample and for each gender, Levene's test (values of the F statistic and its p-value), and t-test information (t statistic, degrees of freedom, and p-value). Statistically significant differences are highlighted in bold when the significance level in the t-test is less than or equal to 0.05.

<TABLE 2 HERE>

Specifically, a statistically different perception among male and female respondents was found for variables V8 to V12, V14, V16, V17 and V19. In all cases, women showed a higher agreement than their male counterparts did. This may be because it is women who directly face these barriers. Women expressed greater agreement on the importance of variables V8 and V9, which show the typical work-family conflict faced by professional women. These

variables can be explained through two lenses: the one of employers and the one of workers. For employers, it is often thought that female workers are more expensive, because women have higher indirect labor costs, as a result of higher absenteeism and turnover due to family obligations (Anker 1997). From the perspective of workers, women take on the majority of the caregiving and household labor (Higgins et al. 2000; Bilbo et al. 2014), even though men and women have a similar desire to start a family and both must balance the demands of work and family life (Dainty and Lingard 2006; Menches and Abraham 2007).

Women also give greater importance to variables V11, V12, V14, V17 and V19 than do their male counterparts. These variables are related to how the difficulties facing women are manifested: informal networks (V11), masculine culture (V14), need to work harder (V19), fewer opportunities (V12), and male attitudes (V17); these last two were not approved in the survey, but women gave them good scores anyway. These differences between genders also confirm the findings of Dainty et al. (2000b). In overall terms, female respondents have a keener perception of invisible barriers in their career development (V10). This perception is coherent with the existence of a glass ceiling for the professional development of women (English et al. 2012; Fernando et al. 2014).

**Principal Component Analysis**

PCA aims to reduce the dimensionality of the data space in order to find the underlying factors that collect the information present in the survey questions. PCA is based on the presence of the correlations between variables, finding a smaller number of dimensions that retain most of the information from the original space. Bartlett’s sphericity test (P) and the Kaiser–Meyer–Olkin measure (KMO) were carried out to determine if the input data set was

appropriate for PCA (Beavers et al. 2013). Bartlett's sphericity test explores the correlation among variables to verify that inter-correlations are present and, therefore, a PCA makes sense. The purpose of KMO is to evaluate sampling adequacy for PCA. Both tests verified the adequacy of the data set for a PCA ($p = 0.000$ for Bartlett's test and KMO = 0.872) (Beavers et al. 2013). Related to KMO, the measures of sampling adequacy for all variables were obtained: all values were between 0.720 and 0.912, confirming the global adequacy given by the KMO. A principal component was considered if its eigenvalue was greater than one. The varimax rotation method was used to minimize the number of variables that had high loadings on each factor. Variables with a weight less than 0.4 were disregarded because they did not have a significant relationship.

The PCA was carried out without variables V10 and V11. V10 ("Women face invisible barriers in their career development") was discarded because it is the dependent variable that summarizes the problems faced by women during their entry and advance in the Peruvian construction industry: it will be used later for the regression analysis. Variable V11 ("Within the construction industry there are informal networks formed by men") was not considered for three reasons: (a) its factor loadings were widely dispersed among different factors; (b) its removal did not change the composition of the constructs; and (c) its elimination increased the percentage of explained variance.

The PCA produced five components (Table 3) that explained 57.06% of the observed variability in the input data set. The level of variance explained by the selected components can be considered acceptable in social sciences research (at least 50% according to Beavers et al. 2013). Obviously, the higher this percentage, the better the results; however, the percentage of variance explained by the selected factors is not the unique criteria to take into

account. In this case, the good results of the Bartlett sphericity test and the KMO indicator, together with this 57% of variance explained, give validity to these results.

<TABLE 3 HERE>

The factor grouping provided the scores for the 18 variables of the five principal components identified in the PCA (see Table 3). Analysis of the factor loading matrix led to a reduced number of components that could explain the underlying factors to professional development of qualified women. The five principal components can be interpreted as follows:

- PC1, “Male Oriented Labor Market”, accounts for more than 29% of the variability of opinions (Table 2). This component seems to portray that barriers faced by qualified women are related to labor matters: men are more readily accepted on the job than women (V16). Therefore, women work harder to access jobs similar to those of their male counterparts (V19) although they have fewer career opportunities than men (V12). In addition, when women take a break from their career (e.g. to care for young children), they experience a loss in the hierarchical order (V8). Besides, the industry does not have flexible hour works, childcare programs or provisions for career breaks (V9). Finally, respondents perceive a masculine culture in the workplace (V14) that means women must adopt male attitudes to be accepted (V17).
- PC2, “Detrimental Issues for being a Woman”, contains four variables. This component explains that being a woman can sometimes be a disadvantage (V20), leading to a situation in which men are in the field while women are more often in the office (V13). It is important to note that variable V20 has a negative loading factor, meaning that womanhood is perceived as a disadvantage. Other conditioning factors for being a woman

identified in PC2 are the possibility of facing sexual harassment at work (V15) and the greater difficulty in controlling subordinates (V18).

- PC3, “Harsh Working Conditions in the Construction Industry”, explains the situations that prevent qualified women from entering and advancing the Peruvian construction industry. This component refers to the tough working conditions and long working hours of construction jobs (V6). In addition, construction jobs can be stressful and demanding (V5), making it difficult to combine work and family life (V7).
- PC4, “Unfavorable Perception of the Construction Industry”, is composed of three variables. In this regard, respondents recognized that the construction industry has a bad image (V1), being conflictive by nature (V4) and that the initial expectations of the construction industry change once someone starts (V2).
- PC5, “High Competitiveness of the Construction Industry”, takes into account variable V3 only, which states that construction jobs are competitive by nature.

**Regression Analysis**

The dependent variable V10 (“Women face invisible barriers in their career development”) was used as dependent variable in a regression analysis in order to check its correlations with the rest of the original variables (barriers) as well as with the principal components obtained using PCA. Table 4 contains these correlations; all of them are significant at 0.99, except V1, even though their values are not too high. According to Cohen (1988), for behavioral sciences, a correlation value r = 0.10 can be considered small, r = 0.30 medium, and r = 0.50 large.

<TABLE 4 HERE>

Later, a linear regression analysis of all variables was performed to study the relationships among variables and to produce a model that explains the dependent variable "invisible barriers women face in their career development" (V10). The forward method was used, and the five factors resulting in the exploratory factor analysis were taken as independent variables. These five factors explain 34.6% of the variance of the dependent variable (adjusted $R^2 = 0.346$), as shown in Table 5.

<TABLE 5 HERE>

There is a significant linear relationship and the hyperplane defined by the regression equation provides a good fit: all the principal components were found to be significantly different from zero at $p \leq 0.01$. Table 6 shows the partial regression coefficients that contain all the information necessary to build the regression equation. Among the five significant factors, "male oriented labor market" (PC1) was found to be the main contributor to the prediction of the underlying factors that condition the barriers faced by women in their career development (V10) (standardized coefficient of 0.514, $p \leq 0.000$, according to Table 6). Standardized coefficients show the degree of influence of the different variables on the response.

<TABLE 6 HERE>

These non-standardized coefficients are interpreted as follows: the coefficient of 1.099 of the variable "male oriented labor market" (PC1) indicates that, if all other variables remain constant, an increase of one unit in "male oriented labor market" corresponds, on average, to an increase of 1.099 on "invisible barriers" (V10). These coefficients are not independent of

each other. Indeed, they are called partial regression coefficients because the specific value for each coefficient is adjusted taking into account the presence of other independent variables. This is why they should be interpreted with caution.

## DISCUSSION

The fact that women work harder than their male counterparts to achieve similar jobs is consistent with previous studies comparing the career advancement of men and women (Dainty et al. 2000a; Hossain and Kusakabe 2005; Dainty and Lingard 2006). In the present study, a young female respondent describes perfectly this obstacle: “The professional development of women in fieldwork requires more effort, dedication and commitment compared to men […]. The way women can achieve absolute control of the working group is by demonstrating capacity and ability to solve problems; in contrast, men only need to impose their presence and their degree in engineering to be respected.”

With respect to the different career opportunities for male and female professionals, previous studies have concluded that they are a result of the organizational structure (Dainty and Lingard 2006), training courses dominated by men (Fielden et al. 2000), and the operation of corporate policies and procedures (French and Strachan 2015; Galea et al. 2015). In this regard, the following statement from another young female engineer is strong evidence of the policies and procedures for staff recruitment: “I've been rejected when applying for a job just because I am a woman; the manager said it was best to hire a man as he would be more willing to do the work when there is the risk of working at heights.”

Regarding the work-family conflict, organizations tend to treat family and work as fully independent factors (Fielden et al. 2000; Menches 2007; Malone et al. 2014). This means that women must find their own balance between the demands of work and family. Indeed, it is women who assume most of the family and domestic responsibilities (Higgins et al. 2000; Bilbo et al. 2014). This is even the case when women have a full-time job and share their lives with partners that have a positive attitude towards domestic partnership; a young male engineer gave an example of this: “Working hours can be eight hours for laborers, but many more for managers; this is most noticeable in private companies, which sometimes have night shifts at the construction sites, making it very difficult for women with families to work on these shifts”. A middle-aged male engineer regarded the imbalance with a stronger statement: “The sin of women in the construction industry is being a mother”. A middle-aged female engineer explained her personal situation: “I can work in the field all day and when I get home, I have to do all the household chores. It is difficult to hire domestic assistants to undertake these tasks. My husband is also an engineer and when he arrives home, he expects to be waited on, even on weekends. There is no rest for women.”

Among the labor issues identified as barriers for qualified women is the masculine culture at work. This is fully consistent with previous research, which described the environment of the construction industry as male-dominated (Gale 1994; Dainty and Lingard 2006; Francis et al. 2014). This situation forces women to demonstrate masculine attitudes in order to be accepted in the construction industry and gain leadership positions (Ness 2012; Denissen and Saguy 2014). Indeed, previous studies have pointed out that the main reason for a slow and inadequate professional development may be the attitudes of women, rather than their skills (Lu and Sexton 2010; French and Strachan 2015; Cheung et al. 2016). In the current study, a senior male engineer declared that “the construction industry is tough, so competition,

494 character and ability to command and lead are needed"; however, he did not explicitly
495 mention if these are characteristics attributable to men or women. Another middle-aged
496 woman noted: "I see corruption in the construction industry. Professionals, managers and
497 representatives of public organizations often form alliances to develop projects, studies, work,
498 etc. These alliances are supported by participation in soccer games or outdoor drinking.
499 Women cannot access these alliances because they usually do not play soccer and they are
500 usually more reluctant to drink alcohol."
501
502 The fact that women perform tasks more closely related to office work (Dainty et al. 2000b;
503 Malone et al. 2014; French and Strachan 2015) was described as a benefit by one young male
504 engineer in the study: "Women in the construction industry tend to be in the office, not by
505 their own efforts, but by friendship or other factors". However, this seemingly innocent
506 benefit actually constitutes a major barrier to women, because it generates a lack of access to
507 other experiences that enable them to achieve their professional development.
508
509 Both male and female respondents in this study agree that sexual harassment is yet another
510 obstacle faced by women in the construction field. Sexual objectification leads to a difficult
511 working environment for women (Byrne et al. 2005; Watts 2007; Denissen and Saguy 2014).
512 These claims are confirmed with evidences given by several respondents. For example, a
513 young male engineer indicated that: "In projects where you need to live in camps, isolated
514 from the population of the city, there is plenty of sexual harassment of the women who work
515 in these projects". Whereas a senior female professional affirmed that: "In approximately 50%
516 of the jobs I have had, I have been sexually harassed by my bosses and sometimes by
517 colleagues". The existence of sexually discriminatory attitudes was also revealed in the
518 comments of a senior male manager: "I think there are jobs that women by their nature will

not be able to perform adequately. There are secondary factors such as if she is pretty, if she has a nice body, or even if she is ugly […]. Anyway, everything is disadvantageous for women."

Respondents in this study also agree that it is more difficult for women to control subordinates; this has been corroborated by previous studies in developing economies (Kaewsri and Tonghong 2011; English and Le Jeue 2012). Ling and Poh (2004) highlighted the fact that many women felt they were not able to work well with contractors and subcontractors, who were usually men. A young female engineer reported the following: "I have been a victim of sexism from a foreman, who indirectly made derogatory comments towards women engineers and women architects, arguing that women in the field of construction are incapable, impractical, inefficient, and generally do not know anything."

## CONCLUSIONS

### Contributions

This study aimed to identify the key barriers that qualified women face during their entry and advance in the construction industry. Initially, 20 barriers were identified through a rigorous analysis of previous contributions. These barriers composed the statements of the questionnaire survey; data was obtained from 429 professionals of the Peruvian construction industry. Regarding its first goal, this research summarized the variables previously proposed by other contributors (in an isolated or more specific way), and tested them using this survey. All these variables but three were considered relevant by the respondents. They did not fully agree that the construction industry had a bad image. Women deemed the other two variables

(women have fewer career opportunities than men and women should adopt male attitudes to be accepted in the industry) as actual barriers, while men did not. This contribution is also linked to the second goal of this research: the different views that men and women have regarding these barriers. The main perceptual dissimilarities found indicate that women place considerable emphasis on the existence of a male culture at work, which is not the case for men. Even though, men interpret womanhood as a form of positive discrimination which, far from being a professional barrier, is considered by them as an advantage. Likewise, women agree that if they take maternity leave, they will suffer a loss in the hierarchical order; furthermore, the sector does not have flexible work schedules, childcare programs, or provisions for career breaks. As the industry is male-controlled so far, the women's vision is not accepted, or even really perceived, by men. This way, no actual means are provided to solve the issues or enhance the current scenario; there is a vicious circle that deters the improvement of this status quo.

Finally, five underlying factors that condition the barriers faced by women in their career development were extracted from the analysis: "male oriented labor market", "detrimental issues for being a woman", "harsh working conditions in the construction industry", "unfavorable perception of the construction industry", and "high competitiveness of the construction industry". The first (and most influential) factor revealed that men are more readily accepted in the workplace compared to women; furthermore, women work harder to get jobs similar to those of their male colleagues. Also, female professionals have fewer opportunities for promotion than males. Summarizing, women face invisible glass ceilings throughout their careers and have fewer professional opportunities than men.

## Practical Implications

The key barrier to address is the male culture at work that includes not only informal networks formed by men but also an absence of flexible work schedules, childcare programs, or provisions for career breaks that deter the compatibility of family and work for women. The recognition of this glass ceiling may allow both public and private organizations to propose actions which guarantee the acceptance and professional development of women in the sector. In this sense, this study informs potential approaches to gender equality. On the one hand, the incorporation of gender equality policies could ensure sustainable development as already proposed by some contributors (French and Strachan 2015; Galea et al. 2015). For companies within the industry, a management system for gender equity (MSGE) is needed to properly implement the business strategy regarding the management of personnel, bearing in mind the criteria of gender equality as an integral element. From the perspective of female workers' rights, public agencies should foster the mainstreaming of gender in the economy through organizational changes in companies within the sector. One example is a certification program in MSGE which involves modifying and ameliorating informal practices, workplace procedures and criteria for promotion, as well as structuring the company in order to ensure equality and fairness for all workers.

On the other hand, it is necessary to devise a strategy that promotes the involvement of women on their own terms, allowing for empowerment processes. The adequate management of diversity in different projects promotes participation. It is necessary to recognize women’s status by their work–family roles, as well as their specific career development plans, offering options for flexible work arrangements and childcare support. Women should be seen as active agents of change. Furthermore, as stated by Aguirre et al. (2012), where female labor

force participation is low and women are well-educated, they can make a stand, as is the case in the Peruvian construction industry.

## Limitations

The main limitation of this research is that it is focused on one single country (Peru), which may limit the generalizability of the findings. However, the initial barriers analyzed in this study were taken from an in-depth literature review; the original contributors carried out their research in different countries, but mainly in the United Kingdom, Australia and the United States; only one of the barriers came from studies carried out in developing economies ("Women have greater difficulty controlling subordinates than men"). This research nonetheless confirmed most of the findings of previous contributors while summarizing and highlighting the key barriers and different perceptions between genders.

## Future Work

Taking the findings of this research as a point of departure, future research is clearly needed to better understand the development patterns and retention barriers affecting women working as professionals in the construction industry. These studies could also focus on other countries to check the findings obtained in Peru. Furthermore, additional regulations should be encouraged that close the gap between the men and women's perception of the field; this can lead the way to more women working in the construction industry. Finally, future research should enhance the understanding of the culture in the industry, through an analysis of corruption and how it affects the different stages of professional experience.

## ACKNOWLEDGEMENTS

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769 **Table 1. Codes, variables and supporting contributions**

| Code | Variable | Supporting Contributions |
|---|---|---|
| V1 | The construction industry has a bad image | Gale 1994; Bennett et al. 1999; Fielden et al. 2000; Kehinde and Okoli 2004; Ling and Poh 2004; English and Le Jeue 2012; Bilbo et al. 2014; French and Strachan 2015 |
| V2 | The initial expectations of the construction sector change once someone starts | Dainty et al. 2000b; Fielden et al. 2000; Lu and Sexton 2010 |
| V3 | Construction jobs are very competitive by nature | Gale 1994; Dainty et al. 2000b; Ling and Poh 2004 |
| V4 | The construction industry is very conflictive by nature | Gale 1994; Dainty et al. 2000b; Menches and Abraham 2007 |
| V5 | Construction jobs are stressful and demanding | Gale 1994; Dainty et al. 2000b; Ling and Poh 2004; Ness 2012 |
| V6 | Construction jobs involve harsh working conditions and long working hours | Dainty et al. 2000b; Agapiou 2002; Ling and Poh 2004; Watts 2007; Ness 2012; English and Le Jeue 2012; Sospeter et al. 2014; French and Strachan 2015 |
| V7 | It is difficult to combine work and family life | Bennett et al. 1999; Dainty et al. 2000b; Higgins et al. 2000; Ling and Poh 2004; Lingard and Lin 2004; Menches and Abraham 2007; Lu and Sexton 2010; English and Le Jeue 2012; Bilbo et al. 2014; Malone et al. 2014 |
| V8 | Women taking a break in their career and those taking an extended leave lose ground in the hierarchical order | Gale 1994; Fielden et al. 2000; Whittock 2002; Lingard and Lin 2004; Byrne et al. 2005; Dainty and Lingard 2006; Madikizela and Haupt 2010 |
| V9 | The construction industry does not have flexible work hours, childcare programs or provisions for career breaks | Gale 1994; Fielden et al. 2000; Whittock 2002; Lingard and Lin 2004; Byrne et al. 2005; Dainty and Lingard 2006; Menches and Abraham 2007; Madikizela and Haupt 2010; Bilbo et al. 2014 |
| V10 | Women face invisible barriers in their career development | Dainty et al. 2000b; Heredia 2004; Ling and Poh 2004; Hossain and Kusakabe 2005; English et al. 2012; Fernando et al. 2014 |
| V11 | Within the construction industry, there are informal networks formed by men | Bennett et al. 1999; ; Dainty and Lingard 2006; Lu and Sexton 2010; Galea et al. 2015 |
| V12 | Women have fewer career opportunities than men | Gale 1994; Dainty et al. 2000b; Ling and Poh 2004; Lu and Sexton 2010; Kaewsri and Tonghong 2014 |
| V13 | Men perform fieldwork whereas women do office-related work | Bennett et al. 1999; Dainty et al. 2000b; Ling and Poh 2004; Hossain and Kusakabe 2005; Kaewsri and Tonghong 2014; Malone et al. 2014; French and Strachan 2015 |
| V14 | There is a masculine culture at work | Gale 1994; Fielden et al. 2000; Ling and Poh 2004; English and Le Jeue 2012; Ness 2012; Denissen and Saguy 2014; Francis et al. 2014; Sospeter et al. 2014; French and Strachan 2015 |
| V15 | Women face sexual harassment at work | Gale 1994; Dainty et al. 2000b; Whittock 2002; Ling and Poh 2004; Byrne et al. 2005; Dainty and Lingard 2006; Watts 2007; Madikizela and Haupt 2010; Choudhury 2013; Denissen and Saguy 2014; Kaewsri and Tonghong 2014 |
| V16 | Males are more readily accepted in the industry than females | Dainty et al. 2000b; Ling and Poh 2004; Choudhury 2013 |
| V17 | Women have to adopt male attitudes to be accepted in the industry | Gale 1994; Denissen and Saguy 2014 |
| V18 | Women have greater difficulty controlling subordinates than men | Ling and Poh 2004; Kaewsri and Tonghong 2010; English and Le Jeue 2012 |

| Code | Variable | Supporting Contributions |
|---|---|---|
| V19 | Women work harder to obtain jobs similar to those of their male counterparts | Dainty et al. 2000b; Hossain and Kusakabe; Dainty and Lingard 2006 |
| V20 | Being a woman can be an advantage | Choudhury 2013; Cheung et al. 2016 |

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**Table 2. Variances and means comparison for gender**

| Code | Mean | S.D. | Mean (Male) | Mean (Female) | S.D. (Male) | S.D. (Female) | Levene's test F | p-value | t value | p - value |
|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 4.09 | 2.04 | 4.036 | 4.23 | 2.0086 | 2.1117 | 1.341 | 0.248 | -0.888 | 0.375 |
| V2 | 5.35 | 2.05 | 5.293 | 5.508 | 2.0908 | 1.9508 | 2.532 | 0.112 | -0.979 | 0.328 |
| V3 | 6.59 | 1.95 | 6.590 | 6.574 | 1.954 | 1.9452 | 0.003 | 0.957 | 0.076 | 0.940 |
| V4 | 5.53 | 2.06 | 5.436 | 5.770 | 2.0655 | 2.0319 | 0.247 | 0.619 | -1.518 | 0.130 |
| V5 | 5.54 | 2.09 | 5.482 | 5.689 | 2.1025 | 2.0533 | 0.006 | 0.939 | -0.924 | 0.356 |
| V6 | 5.67 | 2.10 | 5.58 | 5.885 | 2.1365 | 2.0091 | 0.899 | 0.344 | -1.358 | 0.175 |
| V7 | 5.55 | 2.31 | 5.423 | 5.852 | 2.3354 | 2.2256 | 1.865 | 0.173 | -1.739 | 0.083 |
| **V8** | **5.47** | **2.13** | 5.163 | 6.246 | 2.0355 | 2.1868 | 0.726 | 0.395 | -4.866 | **0.000** |
| **V9** | **6.22** | **2.13** | 6.016 | 6.738 | 2.1289 | 2.0562 | 5.715 | 0.017 | -3.245 | **0.001** |
| **V10** | **5.47** | **2.14** | 5.065 | 6.475 | 2.1502 | 1.7402 | 13.726 | 0.000 | -7.062 | **0.000** |
| **V11** | **6.03** | **1.97** | 5.860 | 6.443 | 2.0556 | 1.6912 | 14.646 | 0.000 | -3.021 | **0.003** |
| **V12** | **4.74** | **2.25** | 4.446 | 5.475 | 2.1312 | 2.3714 | 2.644 | 0.105 | -4.367 | **0.000** |
| V13 | 5.40 | 2.22 | 5.430 | 5.311 | 2.1138 | 2.4666 | 9.438 | 0.002 | 0.467 | 0.641 |
| **V14** | **6.11** | **1.97** | 5.860 | 6.754 | 1.9712 | 1.8105 | 11.898 | 0.001 | -4.498 | **0.000** |
| V15 | 6.10 | 2.01 | 6.029 | 6.279 | 1.9891 | 2.042 | 0.030 | 0.863 | -1.163 | 0.246 |
| **V16** | **5.80** | **2.18** | 5.430 | 6.721 | 2.1627 | 1.9296 | 13.144 | 0.000 | -6.037 | **0.000** |
| **V17** | **4.80** | **2.23** | 4.564 | 5.410 | 2.1704 | 2.2845 | 0.475 | 0.491 | -3.589 | **0.000** |
| V18 | 5.29 | 2.24 | 5.352 | 5.131 | 2.1648 | 2.4222 | 5.112 | 0.024 | 0.877 | 0.382 |
| **V19** | **5.61** | **2.24** | 5.111 | 6.869 | 2.1084 | 2.0528 | 6.097 | 0.014 | -7.941 | **0.000** |
| V20 | 5.57 | 2.03 | 5.494 | 5.708 | 2.0351 | 2.0134 | 0.006 | 0.938 | -0.525 | 0.600 |

Note: Variables in **bold** show statistically significant differences between genders

775 **Table 3. Principal components and rotated loading matrix of the factors**

| Code | PC1 | PC2 | PC3 | PC4 | PC5 |
|---|---|---|---|---|---|
| V16 | 0.739 | | | | |
| V19 | 0.735 | | | | |
| V12 | 0.714 | | | | |
| V8 | 0.576 | | | | |
| V9 | 0.548 | | | | |
| V14 | 0.538 | | | | |
| V17 | 0.483 | | | | |
| V20 | | -0.725 | | | |
| V13 | | 0.719 | | | |
| V15 | | 0.605 | | | |
| V18 | | 0.542 | | | |
| V6 | | | 0.812 | | |
| V5 | | | 0.811 | | |
| V7 | | | 0.547 | | |
| V1 | | | | 0.813 | |
| V2 | | | | 0.595 | |
| V4 | | | | 0.508 | |
| V3 | | | | | 0.809 |
| Eigenvalues | 5.319 | 1.462 | 1.387 | 1.090 | 1.012 |
| Variance (%) | 29.553 | 8.122 | 7.708 | 6.056 | 5.622 |
| Cumulative variance (%) | 29.553 | 37.674 | 45.383 | 51.439 | 57.061 |

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778 **Table 4. Correlation between V10 and the original variables and principal components**

| **V1** | **V2** | **V3** | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V11** |
|---|---|---|---|---|---|---|---|---|---|
| 0.113* | 0.261** | 0.192** | 0.256** | 0.157** | 0.280** | 0.327** | 0.358** | 0.285** | 0.265** |
| **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** | |
| 0.422** | 0.219** | 0.421** | 0.270** | 0.432** | 0.344** | 0.280** | 0.515** | -0.197** | |
| **PC1** | **PC2** | **PC3** | **PC4** | **PC5** | | | | | |
| 0.514** | 0.182** | 0.152** | 0.124** | 0.133** | | | | | |

779 **Correlation significant at 0.99; * Correlation significant at 0.95

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782 **Table 5. Regression model**

| Predictive Variables | R | $R^2$ | $R^2$ adjusted | Standard Error |
|---|---|---|---|---|
| Constant, PC1, PC2, PC3, PC4, PC5 | 0.595 | 0.354 | 0.346 | 1.728 |

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785 **Table 6. Partial regression coefficients**

| Model | Unstandardized coefficients | | Standardized coefficients | T | Sig. |
|---|---|---|---|---|---|
| | B | Standard error | Beta | | |
| (Constant) | 5.466 | 0.083 | | 65.519 | 0.000 |
| PC1 | 1.099 | 0.084 | 0.514 | 13.160 | 0.000 |
| PC2 | 0.389 | 0.084 | 0.182 | 4.656 | 0.000 |
| PC3 | 0.326 | 0.084 | 0.152 | 3.898 | 0.000 |
| PC4 | 0.265 | 0.084 | 0.124 | 3. 171 | 0.002 |
| PC5 | 0.283 | 0.084 | 0.133 | 3. 392 | 0.001 |

Dependent Variable: V10

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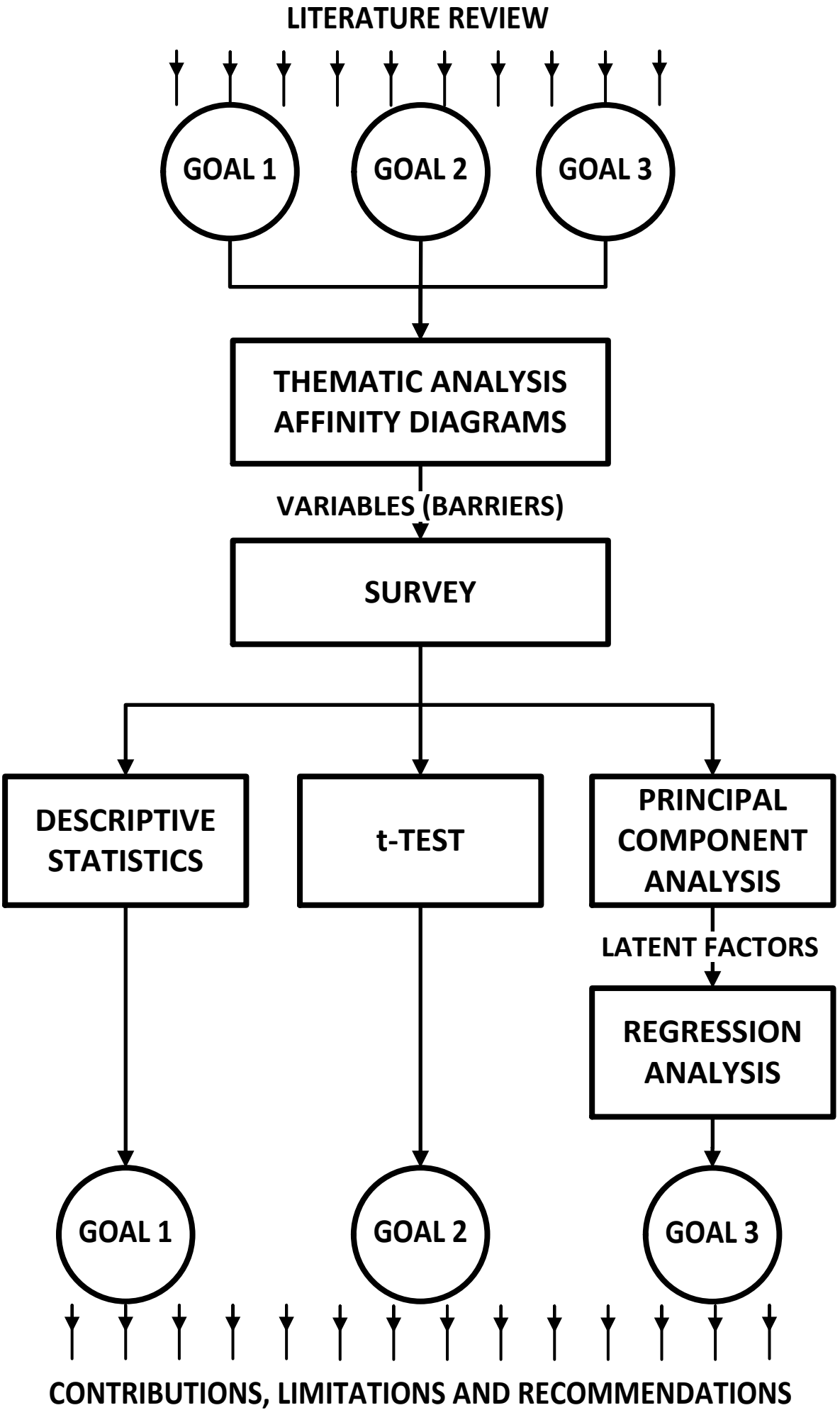
## LIST OF CAPTIONS

**Figure 1. Research process**


LITERATURE REVIEW
GOAL 1
GOAL 2
GOAL 3
THEMATIC ANALYSIS
AFFINITY DIAGRAMS
VARIABLES (BARRIERS)
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