



# Identifying Pertinent Indicators for Assessing and Fostering Diversity, Equity, and Inclusion of the Construction Workforce

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**Abstract:** Structural prejudices and unconscious biases within the construction industry have negatively impacted the construction workforce. Workforce diversity, equity, and inclusion are major concerns in the construction industry. The goal of the present study is to enable the assessment of workforce diversity, equity, and inclusion in the construction industry by identifying and determining the level of influence of applicable indicators revealing diversity, equity, and inclusion at the workforce level. A two-round survey and a panel of 16 experts were utilized to achieve the research goal. After collecting and analyzing the responses, 10 indicators were found to be influential in terms of achieving a diverse, equitable, and inclusive work environment and were therefore considered measures of workforce diversity, equity, and inclusion. These indicators are (1) ethnic and racial diversity at the company level; (2) gender diversity and inclusion at the workforce level; (3) a corporate policy statement on diversity and inclusion; (4) gender/ethnic diversity in leadership/management positions; (5) knowledge and skill diversity; (6) equitable pay/compensation at the industry level; (7) equality, social justice, and nondiscrimination policy statement; (8) pay structure transparency; (9) equitable pay/compensation at the company level; and (10) merit-based transparent recruitment and promotion. The present study contributes to the body of knowledge by providing a means of assessing workforce diversity, equity, and inclusion in the construction industry. It is expected that utilizing the identified indicators would help managers and human resources specialists/professionals in construction perform a thorough assessment of the level of diversity, equity, and inclusiveness of the workforce within their organizations and identify opportunities for enhancing the workforce diversity, equity, and inclusiveness. **DOI: 10.1061/(ASCE)ME.1943-5479.0000885.** © 2020 American Society of Civil Engineers.

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## Point of Departure

Diversity, equity, and inclusion (DEI) are important qualities of any workforce and indicators of the development and sustainability of an industry. Construction is yet to be considered a fully diverse, equitable, and inclusive industry sector (Sang and Powell 2012) due to the structural prejudices and unconscious biases that exist throughout the industry. The construction workforce is dominated by men; in the US, women make up only 1/10 of the overall construction workforce (CPWR 2018) even though 50.8% of the US population are females and 21.9% of civil engineering bachelor's degrees in the US were earned by females over the last two decades (Hickey and Cui 2020). These statistics demonstrate the lack of

diversity and the gender inequity within the construction industry (Navarro-Astor et al. 2017).

Furthermore, challenges related to masculinity, ethnicity, disability, sexual orientation, language, age, and other stereotypes have negatively impacted the experience of marginalized groups and minorities working within the construction industry (Powell and Sang 2013; Al-Bayati et al. 2017). For example, more than two-thirds of people of color working in the UK construction industry have reported restrictions in their career progression due to their race, sexual orientation, or age (Balch 2019). A previous study showed that 60% of all workers in the UK construction industry believe their leaders are biased toward individuals who look, think, and act like them (Balch 2019). This is a global issue that extends beyond the UK construction industry and holds true in many places worldwide (Lingard and Lin 2004; Hunt et al. 2015). In the US, African Americans and Asian Americans, who account for 12% and 6% of the overall workforce nationwide, only represent 6% and 2% of the construction workforce, respectively (Payne 2020). Women fill only less than 4% of executive leadership positions in US engineering and construction companies, leaving little opportunities for female employees to find role models of the same gender in their work environment (Hickey and Cui 2020). Training modules used in the US construction industry fail to address the needs of Hispanic and female construction workers. According to Lin et al. (2018), most training modules in the US construction industry rely on traditional approaches, such as lectures and written documents, and may not address the needs of Hispanic employees with low-literacy and low-English-proficiency (Lin et al. 2018).

With the high turnover rate (Ayodele et al. 2020) and increased labor shortage across different work classifications (Thomas 2013),

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construction organizations have no alternative other than overcoming the aforementioned challenges and creating an equitable, fair, and welcoming work environment for new members entering the job market. Overcoming existing barriers and creating equitable work environments can help the construction industry attract and retain skilled trade members of the workforce and achieve both long- and short-term gains. According to a report published by the AGC (2018), diverse and inclusive organizations reported, on average, 2.3 times higher cash flow per full-time employee. However, in order to achieve such gains, a demonstrable culture change and leadership are needed throughout the industry.

One of the challenges to achieving these needs is that there are no existing studies on how DEI in the construction industry should be assessed. Much of the existing literature focuses on the challenges minoritized and disabled groups as well as females in the architectural, engineering, and construction (AEC) industry are faced with and how they are unfairly treated in many instances (Sang and Powell 2012) rather than on identifying ways to assess workforce DEI. Chan (2013) conducted a study in this regard and found that minorities and certain groups within the UK construction industry oftentimes experience higher levels of bullying and harassment than in other industries, such as nursing. Chan conducted an in-depth analysis of nine real-life stories of members of the lesbian, gay, bisexual, transgender, and questioning (LGBTQ) community in the construction industry and concluded that individuals who identified as members of the LGBTQ community experience numerous problems related to equity and diversity. According to Chan's study, LGBTQ members are perceived as individuals lacking the masculinity needed to successfully perform construction tasks and progress at work. Prior studies have found that LGBTQ construction employees are forced to adapt to the masculine behaviors of both their peers and leaders (Sunindijo and Kamardeen 2017; Hickey and Cui 2020). Such an adaptation puts LGBTQ construction employees under substantial psychological/emotional stress and exposes them to various risks, including the risk of being alienated from their supervisors (Hickey and Cui 2020). These risks may explain why there are proportionally fewer members of the LGBTQ community in the construction industry than in the US population (Payne 2020).

Relatedly, Caven and Astor (2013) conducted in-depth interviews with 55 female architects in the UK and Spain and reported that, in both countries, females encountered various problems, including gender discrimination and work-life conflicts in higher intensity than other occupations, such as manufacturing and education. Although females have entered the architectural profession in the UK much earlier than their Spanish counterparts and are currently represented in higher numbers, the situation in the UK is not better than in Spain, where many female architects reported experiencing discrimination and racism that barred them from progressing at work. Similarly, female architects in Spain reported negative experiences in terms of work-life and childcare (Caven and Astor 2013). Female employees in construction-related occupations, such as surveying, tend to leave the industry in larger numbers than their male counterparts for different reasons, including the industry's long and inflexible working hours as well as lack of opportunities for development and career progression within the industry (Naoum et al. 2020). Dainty et al. (2000) investigated career progression in the construction industry with respect to gender. According to Dainty et al.'s study, women were found to progress one hierarchical level, on average, behind their male peers of the same age, education, and experience.

The present study does not explore the aforementioned issues; instead, it focuses on identifying ways in which these issues can be assessed and mitigated. Accordingly, the overarching goal of the

present study is to enable assessing and improving workforce DEI in the construction industry. Enabling the assessment of the current state of DEI within a company or the entire construction industry will enable identifying existing weaknesses and taking corrective actions to enhance the DEI of the construction workforce within a company or the industry. For example, a company can assess the level of DEI and determine whether attention should be given to a single element or multiple elements of DEI. Such a process is expected to bring benefits to all construction stakeholders, especially construction employees. The problem is that the indicators that should be used to assess and improve workforce DEI within an organization, and the level of influence of each indicator, are unknown. The goal of the study is to overcome this problem and enable assessing and improving workforce DEI in the construction industry. To do so, two research questions were posed:

- What are the applicable indicators for assessing and improving workforce DEI in the construction industry?
- What is the level of influence of each indicator in terms of achieving workforce DEI in the construction industry?

Answering these research questions will lead to identifying the indicators needed to assess and improve workforce DEI in the construction industry. In addition, the findings will provide insights about the level of influence of each indicator in terms of achieving DEI at the workforce level, all of which should increase the industry capacity and improve workforce management in construction.

## Research Methodology

The research team elected to use the Delphi technique to achieve the research goal and answer the research questions outlined in the previous section of this manuscript. The Delphi technique is a multiround, structured, and interactive survey method to obtain insights from a panel of subject-matter experts on a certain topic (Hallowell and Gambatese 2010; Belton et al. 2019). One of the strengths of the Delphi technique is that it is a group approach relying on the idea of achieving group consensus. The idea of achieving consensus (i.e., the convergence of opinions toward a high level of agreement) among the group responses minimizes potential bias and strengthens the reliability of findings obtained from the Delphi process (Hallowell and Gambatese 2010; Belton et al. 2019; Heiko 2012). Statistical measures, such as standard deviation and an interquartile range, are typically used to assess the level of consensus within the group after each round of the Delphi process (Hallowell and Gambatese 2010; Belton et al. 2019; Heiko 2012). It is also critical that the Delphi panelists are carefully selected and that they are highly qualified individuals on the subject matter (Hallowell and Gambatese 2010; Sierra et al. 2016; Yeung et al. 2009). The present study puts special emphasis on the selection of the panel members, as explained in the next section of this manuscript.

The Delphi process has been extensively used in construction research over the last 20 years. Numerous studies (e.g., Chan et al. 2001; Yeung et al. 2009; Sierra et al. 2016; Mayo and Issa 2016) have successfully utilized the Delphi technique to achieve reliable research findings. To provide a few examples, Chan et al. (2001) utilized the Delphi process and a panel of 8 subject-matter experts to develop a multiattribute model for selecting procurement systems for different construction projects. Similarly, Yeung et al. (2009) utilized the Delphi process and a panel of 22 construction experts to identify key performance indicators influencing the success of relationship-based construction projects in Australia. More recently, Gharaibeh (2014) utilized the Delphi process and a panel of 15 construction experts to study the causes of cost overruns in

construction projects and identify efficient methods to control project costs in the construction industry.

The present study utilized the Delphi process to identify applicable indicators for assessing workforce DEI in the construction industry as well as determining the level of influence of each indicator in terms of achieving DEI at the workforce level. The subsequent sections explain the process used to select and qualify the expert panelists needed for the Delphi process and the results from the implementation of the Delphi process, respectively.

## Panel Selection for Delphi Process

As previously stated, the success of the Delphi process relies significantly on the qualifications of the panel members. To select a highly qualified panel of experts for the present study, the researchers used a two-step process. Individuals from both industry and academia were considered for inclusion in the Delphi panel, as recommended by Hallowell and Gambatese (2010). Forming a panel of experts with individuals from both industry and academia ensures that the feedback provided by the panel is theoretically rigorous (i.e., based on valid theories of human behaviors) while practically feasible and widely accepted across the industry.

In the first step of the selection process, the researchers relied on their personal judgment to determine whether an individual is qualified for consideration for inclusion on the Delphi panel. The researchers took independent approaches to select potential participants for consideration for inclusion on the Delphi panel depending on whether the population the participant comes from is industry or academia. For industry professionals, the selection of participants relied on the role and position of each participant within their organization with respect to human resources management as well as their education, title, and involvement in the industry. Parallel to this selection process, the selection of participants from academia relied on the authorship of research articles related to human resources management, such as workforce development, diversity and inclusion, and equity. Only individuals who worked and are located in the US at the time of the research were considered for participation in the study. After an extensive search for potential participants, a list of 67 potential experts (22 from academia and 45 from industry) was created. The researchers contacted the 67 identified individuals, described the research to them, and invited them to participate in the study. Participation on the Delphi panel was contingent upon the qualification results from the second step of the selection process. Nineteen participants (28%) out of the 67 individuals agreed to participate in the study and be part of the Delphi panel if they were found to be qualified experts for inclusion on the panel.

In the second step of the selection process, an email was sent to the 19 participants who expressed their willingness to participate in the study. The email solicited information about their qualifications, education, experience, and so forth. The purpose of soliciting this type of information was to determine whether the participants qualified as experts to participate in the study and be on the panel. For this purpose, a point-system qualification process from Hallowell and Gambatese (2010) was adopted. This point system has been used by tens of studies in construction research, such as Alomari et al. (2018) and Jafari et al. (2019), and is widely supported by methodologists with expertise in the Delphi method (Belton et al. 2019). The qualification point-system process includes criteria related to education, professional experience, membership of professional committees, professional registration, academic and industry publications, and overall contributions to the profession that are used to quantitatively examine whether an individual is a

**Table 1.** Point system qualification criteria

Criteria	Weight
Education	Four-year university degree (4 points) 1–2 years graduate degree (+2 points) Doctorate degree (+4 points)
Years of professional experience	1 point (each)
Professional committees	3 points (each)
Professional registration	3 points (each)
Publications	Books (4 points each) Peer-reviewed journal articles (2 points each) Conference/industry articles (1 point each)

Source: Adapted from Hallowell and Gambatese (2010).

construction expert or not. Each of the criteria is weighted differently, as shown in Table 1. Based on recommendations from previous studies (Hallowell and Gambatese 2010; Alomari et al. 2018), an individual is considered an expert if he/she collectively earns 11 points or more distributed over multiple criteria.

Sixteen participants (84%) out of the 19 individuals who initially expressed their willingness to be part of the study provided information related to the qualification criteria shown in Table 1. After collecting and analyzing the provided information, all of the individuals earned more than 11 points and, therefore, were considered qualified experts to participate in the study and serve on the panel. Table 2 shows the qualification data of the expert panelists. As can be observed in the table, most panelists earned scores that are considerably higher than the 11-point threshold. Even the panelist who earned the lowest score (14 points) is highly qualified with a graduate degree, five years of professional experience, and two publications on topics related to human resources management. To ensure all of the panelists are experts on the topic, the researchers asked the participants to indicate their number of years of involvement on relevant matters, such as workforce management, diversity, equity, training, and safety, as suggested by Belton et al. (2019). All of the panelists indicated that their positions had included direct involvement in efforts to manage and develop human resources; the involvement of members of the panel in human resources management and development ranged from 4–30 years. The panel members also had unique characteristics and qualifications that made them of high value and relevance to the present study. At least two of the panelists are persons of color who represent marginalized groups. One panelist is a cochair of a diversity committee and has over 20 years of experience working on addressing issues related to diversity and equity in the construction industry. In the end, the panel included experts from both industry (11 experts) and academia (5 experts). Recruiting participants from both industry and academia reinforces confidence in the responses obtained from the panel and ensures that any findings are of practical and scientific basis.

In terms of the panel size, a panel of 16 experts is within the suggested range provided by existing literature (Hallowell and Gambatese 2010; Belton et al. 2019; Kamaruzzaman et al. 2019) and consistent with past Delphi studies in construction (Chan et al. 2001; Yeung et al. 2009; Gharaibeh 2014).

## Survey Development and Distribution

As part of the Delphi process, a survey questionnaire was developed for use as the data collection instrument. The questionnaire aims to collect data from the expert panel regarding applicable

**Table 2.** Qualification data of the expert panel

Panelist	Education	Experience (years)	Professional committees	Professional registration	Books	Peer-reviewed articles	Conference or industry articles	Total points
A-1	Ph.D.	18	2	2	0	3	6	52
A-2	Ph.D.	14	1	0	1	6	2	45
A-3	Ph.D.	29	5	1	16	74	110	361
A-4	Ph.D.	15	1	2	0	15	23	87
A-5	Ph.D.	28	2	0	2	41	158	292
I-1	B.A.	15	0	1	0	0	0	22
I-2	B.S.	8	2	2	0	0	0	24
I-3	M.S.	20	1	1	0	0	0	32
I-4	B.A.	16	0	2	0	0	0	26
I-5	M.S.	37	0	1	0	1	1	49
I-6	M.S.	5	0	0	0	1	1	14
I-7	M.S.	40	3	1	0	0	2	60
I-8	M.S.	35	0	1	0	0	0	44
I-9	M.S.	30	2	0	0	0	0	42
I-10	M.S.	15	0	1	0	0	0	24
I-11	B.S.	40	2	0	2	1	6	66

indicators for assessing and improving DEI of the construction workforce (Objective #1) as well as the level of influence of each indicator on improving DEI at the workforce level (Objective #2). Before sending it to the panel, the questionnaire was pilot tested with three individuals (two from academia and one from industry) who were not selected for inclusion on the study panel. Suggested comments from the pilot testing were incorporated into the questionnaire, and then the questionnaire was sent to the expert panelists to solicit their input. Two rounds of surveys were used as previously described in this manuscript. The panelists did not know the identity of the other participants on the panel. The research team managed the survey process independently and maintained confidentiality throughout the process.

In the first round of the Delphi process, the panelists were asked to suggest applicable indicators for assessing and improving DEI at the workforce level. An indicator was defined as *any practice, procedure, and policy that can be used by a construction company to assess, foster, and/or improve workforce diversity, equity, and inclusion*. Such an indicator could provide an indication about the current state of the workforce diversity, equity, or inclusion within a company by revealing the level of presence of the practice, procedure, or policy implemented by the company to foster and improve diversity, equity, or inclusion at the workforce level. To avoid confusion and ensure that all panelists had a common understanding of the topics, the terms diversity, equity, and inclusion were defined as shown:

- Diversity and inclusion: the extent to which the workforce is diversified and inclusive with respect to personal characteristics (e.g., gender, experience, race, social status, and education) and to which diversity and inclusion are integrated into and promoted within the workplace where all members of the workforce feel welcome and accepted (Gambatese et al. 2019).
- Equity: the extent to which workers feel treated and compensated fairly, evaluated equally, and respected without any discrimination in terms of personal characteristics, employment level, payment, workload and responsibilities, promotion, and work opportunities (Gambatese et al. 2019).

In the second round of the Delphi process, all suggested indicators were given to the panelists, and the panelists were asked whether they agree that the indicators suggested in the first round are important constructs of workforce DEI. In addition, the second-round survey included a question asking the panelists to weigh the level of influence of each suggested indicator on achieving

workforce DEI. A 5-point Likert scale in which 1 represents *low influence*, 3 represents *moderate influence*, and 5 represents *extreme influence* was adopted, consistent with previous Delphi studies (Alomari et al. 2018; Belton et al. 2019; Jafari et al. 2019).

## Survey Results and Analysis

This section presents the results and analysis of the two rounds of surveys conducted as part of the Delphi process. Each survey round will be discussed individually.

### Round 1 of Delphi Survey

The first round of the survey asked the panelists to suggest relevant and applicable indicators for assessing and improving DEI at the workforce level. Two main questions were asked. The first question asked the panelists to suggest relevant indicators for assessing and improving diversity and inclusion of the workforce, and the second question asked the panelists to suggest relevant indicators for assessing and achieving equity in the workplace. Fifteen (94%) of the 16 panelists responded to the questionnaire and provided their feedback; one panelist did not participate in the survey and was thereby removed from the panel. After collecting and analyzing the responses, a total of 69 suggestions were made regarding relevant indicators for workforce DEI in construction. The research team closely examined the suggested indicators to unify wording, group similar indicators, remove incomplete feedback, and so forth. To provide an example, *transparent pay*, *pay transparency*, and *salary transparency* were grouped into a single indicator entitled *pay structure transparency*. After grouping similar terms, the list of indicators was reduced and included 20 indicators—9 indicators for diversity and inclusion and 11 indicators for equity. Table 3 shows the suggested DEI indicators along with their frequency.

### Round 2 of Delphi Survey

As shown in Table 3, the first round of the Delphi process led to the identification of 20 indicators for assessing and improving workforce DEI in the construction industry. The research team decided to remove the indicators that were suggested by only one panelist (Table 3) prior to giving the list back to the expert panelists. This decision places more emphasis on indicators supported by a sufficient number of experts and is of a high impact on achieving

**Table 3.** Suggested indicators by the expert panel ( $n = 15$ )

Attribute	Suggested indicator	Frequency
Diversity and inclusion	Ethnic and racial diversity at the company level	8
	Gender diversity and inclusion at the workforce level	6
	Zero tolerance on harassment and/or inappropriate behavior/language	3
	Corporate statement on diversity and inclusion	2
	Gender/ethnic diversity in leadership/management positions	2
	Knowledge and skill diversity	2
	Merit-based recruitment and promotion regardless of gender/ethnicity	1
	Management demographics that reflect the workforce	1
	Engagement level with other groups outside the organization	1
	Equity	Equitable pay/compensation at the industry level
Equality, social justice, and nondiscrimination policy statement		4
Pay structure transparency		3
Equitable pay/compensation at the company level		3
Merit-based transparent recruitment and promotion		3
Set expectations for positions		2
Gender pay equality		1
Professional HR staff to manage employee pay		1
Turnover rates		1
Pay for performance		1
Employee stock ownership plan (ESOP)	1	
Total	20 indicators are suggested	53

diversity, equity, and inclusiveness of the workforce. This process leads to the removal of eight indicators from the list (merit-based recruitment and promotion regardless of gender/ethnicity, management demographics that reflects the workforce, engagement level with other groups outside the organization, gender pay equality, professional HR staff to manage employee pay, turnover rates, pay for performance, and employee stock ownership plan), leaving a total of 12 indicators for assessing and improving workforce DEI in construction—6 indicators for diversity and inclusion and 6 indicators for equity.

Although the removal of the eight indicators mentioned previously is well-justified, their relevance to enhancing DEI should be acknowledged. For instance, research has shown that organizations who commit to a gender equality pay scale and implement policies to eliminate gender-based wage discrimination tend to attract innovative and skilled employees (Just Label 2019). Likewise, having an employee stock ownership plan within an organization enhances company culture and improves employees' sense of belonging, leading to higher employee retention rates and lower employee turnover rates (Brandt 2019; Radogna and Pia 2019). Equally important, prior studies in construction have identified a statistically significant positive association between employee engagement levels and factors, such as work-life balance, career progression, and workplace safety conditions (Karthikeyan et al. 2013; Whiteoak and Mohamed 2016; Karakhan et al. 2018). A report published by the AGC (2018) revealed that employees not well integrated into

**Table 4.** Panel responses regarding retention of indicators ( $n = 13$ )

Attribute	Indicator	Retain (count)		Retain (%)	
		Yes	No	Yes	No
Diversity and inclusion	1. Ethnic and racial diversity at the company level	11	2	85	15
	2. Gender diversity and inclusion at the workforce level	12	1	92	8
	3. Zero tolerance for harassment and inappropriate behavior/language	12	1	92	8
	4. Corporate statement on diversity and inclusion	10	3	77	23
	5. Gender/ethnic diversity in leadership/management positions	12	1	92	8
	6. Knowledge and skill diversity	10	3	77	23
Equity	1. Equitable pay/compensation at industry level	11	2	85	15
	2. Equality, social justice, and nondiscrimination policy statement	12	1	92	8
	3. Pay structure transparency	12	1	92	8
	4. Equitable pay/compensation at the company level	10	3	77	23
	5. Merit-based transparent recruitment and promotion	10	3	77	23
	6. Set expectations for positions	6	7	46	54

a workplace culture are more likely to be involved in work-related accidents due to the high levels of psychological and emotional stress experienced by them. The same report stated that 65% of employees who had experienced exclusive behaviors indicated that they would leave, or seriously think about leaving, their jobs (AGC 2018). Given the unprecedented skilled labor shortage in the construction industry, hiring a diverse and inclusive pool of employees is a key element to lowering employee turnover rates (AGC 2018).

In the second round of the Delphi process, the panelists were asked if the 12 suggested indicators should be retained as important constructs of workforce DEI in the construction industry. Thirteen (87%) of the 15 panelists who participated in Round #1 responded to the questionnaire and participated in the second round of the survey. The results from the second round regarding what indicators to retain for assessing and improving DEI at the workforce level are summarized in Table 4.

Based on the results presented in Table 4, 11 of the 12 indicators were supported by the majority (more than 50%) of the panelists, and only one indicator (set expectations for positions) was not supported by the majority of the panelists (Table 4). In the present study, majority is defined as the agreement/disagreement of more than 50% of the participants. The 50% rule has been used by several previously conducted Delphi studies (Al-Marzouki et al. 2005; Heiko 2012; Fox et al. 2016; Allen et al. 2019). Following the 50% rule led to the removal of one indicator (set expectations for positions) from the list of indicators for assessing and improving workforce DEI in construction.

In addition, the panelists were asked in this survey round to weight the influence of each indicator on achieving workforce DEI using a 5-point Likert scale (1 = low influence, 2 = minor influence, 3 = moderate influence, 4 = high influence, and 5 = extreme influence). Panelist responses were collected and then analyzed to determine the relative weights of the indicators. For the analysis, the median values were used in this case as a measure of centrality as recommended by Hallowell and Gambatese (2010), Belton et al. (2019), and Kamaruzzaman et al. (2019). Table 5 shows the median values for the 11 retained indicators. For small

**Table 5.** Influence of indicators on achieving workforce diversity, equity, and inclusion ( $n = 13$ )

Attribute	Indicator	Level of influence		
		Median	Standard deviation	Relative weighting factor
Diversity and inclusion	1. Ethnic and racial diversity at the company level	3	0.83	1.00
	2. Gender diversity and inclusion at the workforce level	4	0.87	1.33
	3. Zero tolerance for harassment and inappropriate behavior/language	4	1.12	1.33
	4. Corporate statement on diversity and inclusion	4	0.99	1.33
	5. Gender/ethnic diversity in leadership/management positions	5	1.03	1.66
	6. Knowledge and skill diversity	3	0.83	1.00
Equity	1. Equitable pay/compensation at industry level	4	0.37	1.33
	2. Equality, social justice, and nondiscrimination policy statement	4	0.37	1.66
	3. Pay structure transparency	4	0.43	1.33
	4. Equitable pay/compensation at the company level	4	0.50	1.33
	5. Merit-based transparent recruitment and promotion	4	0.39	1.33

Note: 1 = low influence; 2 = minor influence; 3 = moderate influence; 4 = high influence; and 5 = extreme influence.

data sets, the median is considered a more realistic measure of centrality than other measures, such as the arithmetic average (i.e., mean) because of its resistance to outliers (Starnes et al. 2003).

To measure the consensus of the responses (i.e., the responses are within an acceptable level of dispersion), a standard deviation was used, as recommended by Hallowell and Gambatese (2010), Belton et al. (2019), and Kamaruzzaman et al. (2019). According to previous studies (West and Cannon 1988; Rogers and Lopez 2002), a standard deviation of 1.64 or below indicates an acceptable level of dispersion within the responses. Consequently, a consensus is considered reached if the standard deviation of the responses is equal or below 1.64. Based on the values shown in Table 5, it can be concluded that consensus was reached for all of the indicators.

Furthermore, the relative weighting factors (RWFs) were calculated. The weighting of an indicator is calculated by taking the median value of the indicator and dividing it by the smallest median value reported in the data. The weighting factor calculated using this approach is the level of influence of an indicator relative to other indicators on achieving workforce diversity, equity, and inclusiveness in the construction industry.

## Findings and Discussion

The Delphi process entailing two rounds of surveys led to the identification and quantification of 11 indicators for assessing and fostering DEI in construction at the workforce level. The 11 indicators are listed in Table 5. It should be noted that some panelists recommended combining *zero-tolerance on harassment and inappropriate behavior/language* and *corporate statement on diversity and inclusion* under a single indicator entitled *corporate statement and policy on diversity and inclusion*. The specified indicators are similar in which they emphasize the existence of a corporate statement to support a diverse and inclusive work environment and a policy to assert zero-tolerance for harassment and inappropriate behavior/language in the workforce. Based on the feedback, the research team decided to merge the aforementioned indicators for diversity and inclusion under a single indicator entitled *corporate statement and policy on diversity and inclusion*.

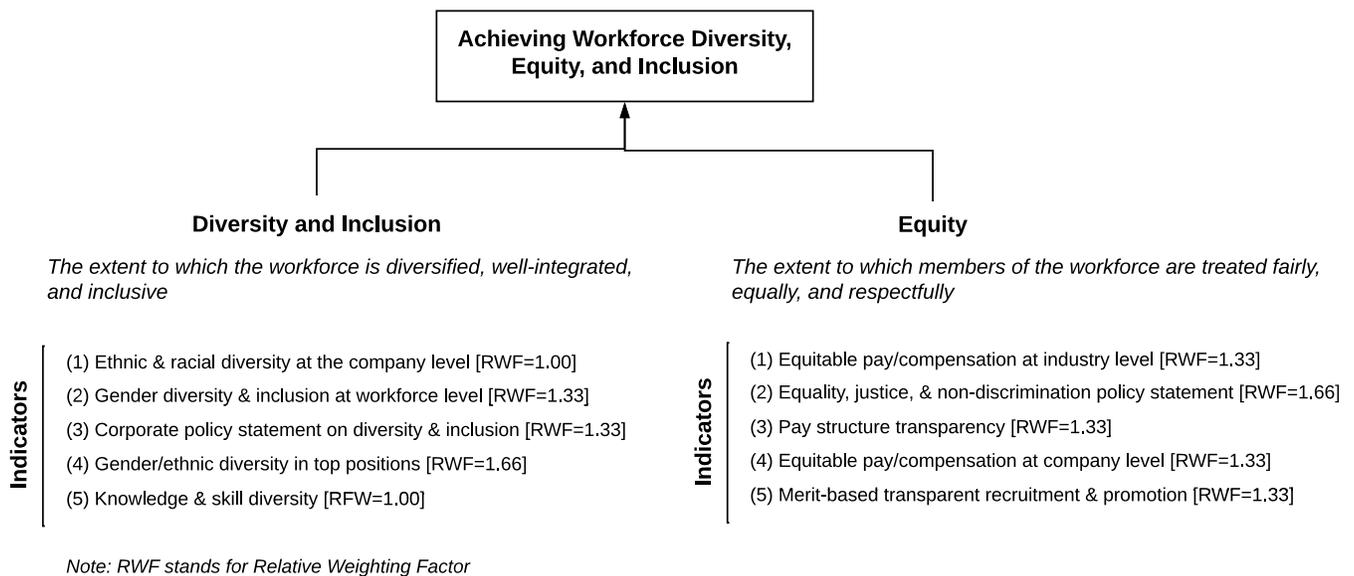
This adjustment reduced the total number of indicators for assessing and fostering workforce DEI to 10 indicators: 5 for diversity and inclusion and 5 for equity. The five indicators of workforce diversity and inclusion are as follows: (1) ethnic and racial diversity at the company level; (2) gender diversity and inclusion at the workforce level; (3) corporate statement and policy on

diversity and inclusion; (4) gender/ethnic diversity in leadership/management positions; and (5) knowledge and skill diversity. Similarly, the five indicators of workforce equity are as follows: (1) equitable pay/compensation at the industry level; (2) equality, social justice, and nondiscrimination policy statement; (3) pay structure transparency; (4) equitable pay/compensation at the company level; and (5) merit-based transparent recruitment and promotion. Fig. 1 illustrates the findings of the study and highlights the identified indicators for assessing workforce DEI in construction.

Based on the findings from this study (Table 5 and Fig. 1), it can be observed that the level of influence varied depending on the indicator, but all of the indicators have a noteworthy influence on impacting the workforce DEI. To be specific, the majority (60% or six out of 10) of the identified indicators are categorized as highly influential on impacting workforce DEI in construction, according to feedback from the expert panel. These indicators are *gender diversity and inclusion at the workforce level*, *corporate policy statement on diversity and inclusion*, *equitable pay/compensation at the industry level*, *pay structure transparency*, *equitable pay/compensation at the company level*, and *merit-based transparent recruitment and promotion*. The remaining four practices, which accounted for 40% of the total number of identified indicators, are categorized as either extremely or moderately influential on impacting construction workforce DEI. *Ethnic and racial diversity at the company level* and *knowledge and skill diversity* are found to be moderately influential; while, *gender/ethnic diversity in leadership/management positions* and *equality, social justice, and nondiscrimination policy statement* are found to be extremely influential on impacting workforce DEI.

The relative weighting factors (RWFs) were also calculated. To reiterate, the weighting factor of an indicator is a relative number to the weightings of other indicators, indicating the importance of the indicator on achieving workforce DEI in construction. As it can be seen in Fig. 1 and Table 5, the RWFs of the *ethnic and racial diversity at the company level* and *gender diversity and inclusion at the workforce level* indicators are 1.33 and 1.00, respectively. This means that the influence of ethnic and racial diversity at the company level on achieving the workforce DEI is 1.33 more than the influence of gender diversity and inclusion at the workforce level.

The indicators asserted to be of extreme influence (RWF = 1.66) are *gender/ethnic diversity in leadership/management positions* and an *equality, social justice, and nondiscrimination policy statement*. According to the study findings, *gender/ethnic diversity in leadership/management positions* have an extreme influence on achieving workforce DEI in construction. The study panelists



**Fig. 1.** Final list of indicators for achieving workforce diversity, equity, and inclusion.

stated that building a diverse and inclusive workforce should start from the top by implementing and actively reinforcing ways to foster diversity at the leadership and management levels. This attitude demonstrates a high-level commitment to diversity and inclusion within the organization and ensures that the organization and its culture foster acceptance, respect, and inclusion of all of the employees regardless of gender, race, and ethnicity (Gambatese et al. 2019). This attitude should extend beyond employees to interactions with the corporate partners and the general public as well. Just Label (2019)—a voluntary disclosure program to publicly share how organizations treat their employees—includes specific requirements regarding gender and ethnic diversity at the leadership and management levels. Just Label (2019) recommends that 25%–35% of leadership and management staff be women and that a percent that mirrors the demographics in the geographical area over which the organization is operating be minorities. Hunt et al. (2015) found that in the United States, “for every 10 percent increase in racial and ethnic diversity on the senior executive team, earnings before interest and taxes (EBIT) rise 0.8 percent.”

Comparatively, *ethnic and racial diversity at the company level* was identified as moderately influential (RWF = 1.33) on impacting the DEI at the workforce level. This finding is surprising at the outset because gender and ethnic diversity at management and leadership levels was regarded to have an extreme influence (RWF = 1.66) on achieving workforce DEI. The experts on the study panel were of the opinion that, in the end, the impact of ethnic and racial diversity on the personal experience of members of the workforce is limited if not reinforced by a leadership and management staff that supports workplace diversity and inclusiveness. Just Label (2019) recommends a maximum of a 10%–25% deviation from the current state census data on aggregated Caucasian and non-Caucasian ethnicity and racial demographics within organizations in order for organizations to be labeled as *just*.

*Knowledge and skill diversity* was identified as moderately influential (RWF = 1.00) on achieving a diverse, equitable, and inclusive construction workforce. This indicator is not rated as highly or extremely influential because the panelists believed that knowledge and skill diversity, while associated with substantial improvement in productivity, does not directly create a diverse, equitable,

and inclusive work environment. This finding is consistent with past literature in which Hall (2016) stated that skill diversity (e.g., multiskilling) impacts work performance directly and workforce diversity indirectly. To demonstrate knowledge and skill diversity, an organization should have a specific procedure or a policy to establish workgroups of collective education and experience that could perform work safely and effectively (Gambatese et al. 2019).

Interestingly, the expert panelists stated that while DEI are all imperative attributes of achieving a connected and resilient workforce, equity should be given the priority-in-order over diversity and inclusion. Priority-in-order does not mean that more emphasis should be given to equity over diversity and inclusion; instead, it means that establishing an equitable work environment in regard to pay, workload, responsibility, promotion, and so forth must chronologically occur first, or in parallel with any effort to attract and retain a diverse and inclusive pool of employees with regard to experience, knowledge, skills, ethnicity, race, and gender. To provide an example, one could consider a relatively new company that is in its infancy stage of attracting and retaining a diverse and inclusive work environment. In this case, such a company should ideally start with assessing and improving the five indicators of equity (shown on the right side of Fig. 1) initially and then move forward to assessing and improving the five indicators of diversity and inclusion (shown on the left side of Fig. 1). In case all attributes (diversity, equity, and inclusion) are lacking, the company should first establish an equitable work environment for existing employees, and once such an environment is established, further actions could be taken to attract a diverse and inclusive pool of employees. While it is possible to achieve both at the same time (i.e., establishing an equitable work environment and attracting a highly skilled and diverse workforce), it is typically more challenging to do so in the early stages of founding and fostering a diverse, equitable, and inclusive work environment. Bolger (2017) stated equity is a process that leads to positive outcomes with regard to diversity and inclusion.

It should be noted that the identified indicators are assessed at the workforce level, company level, or industry level. The workforce level refers to all employees within a company, whether they are frontline workers or senior management positions.

The company-level encompasses employees, owners, directors, the chief executive officer, and so forth. Finally, the industry level refers to cases in which a comparison with industry-standard practices and expectations is needed.

## Research Limitations

The present study has limitations that must be acknowledged. First, the identification process relied solely on input from a panel of experts using a questionnaire survey, and the research did not involve any experimental analysis and data from the field. Experimental data is typically more reliable than survey data because it represents empirical data from real case scenarios (Hill et al. 2004). While the Delphi process relies on a survey approach, its inherent controls and methods support conclusive and reliable results; consequently, the researchers place a high level of confidence in the study findings. Second, the study results were based on the opinions of construction experts occupying advanced positions. Construction experts may have different beliefs and experiences than actual field personnel in entry-level positions. To minimize this potential bias, the panel members were asked to think from the perspective of the workers when responding to the survey questions. Third, the study did not examine the cost and effort associated with utilizing each of the indicators for assessing workforce DEI in a construction company. Measuring some of the indicators may require more effort and additional cost than other indicators. Therefore, determining the cost and effort associated with each indicator can help construction organizations utilize their resources and implement an effective plan for advancing the experience of their human resources. Future research should examine the cost and effort required to utilize each of the 10 identified indicators of workforce DEI. Finally, the present study only focused on identifying and quantifying the indicators of DEI. However, in order to quantitatively assess the level of DEI within a company or an organization, both the indicators and metrics of workforce DEI are needed. Future studies should explore this area and identify the metrics needed to measure the indicators of DEI quantitatively.

## Conclusions and Recommendations

Workforce DEI is a major concern in the construction industry. In order to improve DEI at the workforce level, a unified approach for assessing these three attributes is needed. Such an approach should ideally include applicable indicators that construction organizations can use to gauge and assess the level of workforce DEI within their organizations. The goal of the present study was to enable assessing workforce DEI in the construction industry by (1) identifying applicable indicators for assessing DEI and (2) quantifying the level of influence of each indicator on achieving workforce DEI. To accomplish the research goal, a panel of subject-matter experts was created, and a multiround survey of the panel members was carried out. The expert panelists were asked to identify practices, procedures, and policies (referred to as indicators) for assessing the level of workforce DEI within an organization. Based on the collected survey responses, 10 indicators were identified: (1) ethnic and racial diversity at the company level; (2) gender diversity and inclusion at the workforce level; (3) corporate statement and policy on diversity and inclusion; (4) gender/ethnic diversity in leadership/management positions; (5) knowledge and skill diversity; (6) equitable pay/compensation at the industry level; (7) equality, social justice, and nondiscrimination policy statement; (8) pay structure transparency; (9) equitable pay/compensation at the company level; and (10) merit-based transparent recruitment and promotion.

The level of influence of each indicator on achieving DEI at the workforce level was also determined based on feedback from the expert panel. It was found that the majority (60% or six out of 10) of the identified indicators are categorized as highly influential to achieving a diverse, equitable, and inclusive work environment. The remaining four indicators (40% of the total number of indicators) are categorized as either extremely or moderately influential on impacting construction workforce DEI. Two indicators (*ethnic and racial diversity at the company level* and *knowledge and skill diversity*) were found to have a moderate influence on achieving the DEI; the other two indicators—*gender/ethnic diversity in leadership/management positions* and *equality, social justice, and nondiscrimination policy statement* to be specific—were labeled to have an extreme influence on achieving the DEI of the construction workforce.

The present study contributes to the body of knowledge by identifying and quantifying applicable indicators for assessing and fostering workforce DEI in the construction industry. The study contribution is of both theoretical and practical value. Particularly, the study provides quantitative data regarding the influence of the indicators in terms of fostering and improving construction workforce DEI. Utilizing applicable indicators for assessing DEI at the workforce level can help managers and human resources specialists/professionals within an organization perform a thorough assessment of the workforce needs, identify vulnerabilities, and support proactive actions needed to enhance DEI levels within the organization, all of which ultimately result in a more productive and resilient work environment. Preparing and nurturing a productive and resilient work environment benefits the entire community at work (both intrinsically and extrinsically) and impacts the lives of construction employees as well as the quality of construction work positively, which is desirable for all construction stakeholders. For instance, companies can assess their workforce diversity using the five indicators shown in Fig. 1. To be more specific, a company can determine ethnicity and racial diversity both at the workforce level and in leadership positions using deviations from the current state census data on aggregated Caucasian and non-Caucasian ethnicity and racial demographics as explained in the “Findings and Discussion” section. The company can then use the obtained levels to gauge ethnicity and racial diversity in subsequent periods and determine actions needed to foster workforce diversity at the company.

Future studies should examine the 10 identified indicators in more depth and ensure that they are regarded by construction employees in entry-level positions as influential practices, procedures, and policies for achieving a diverse, equitable, and inclusive work environment. In addition, creating an evaluation procedure that utilizes the identified indicators and includes a quantitative assessment of DEI at the workforce level is needed. Integrating applicable indicators into an evaluation procedure could be a valuable tool to enhance employee diversity, equity, and inclusiveness throughout the construction industry. Such an effort can ensure that the construction industry is not lagging behind other industries in terms of creating a diverse, equitable, and inclusive work environment for all employees.

## Data Availability Statement

Data from the survey (responses to the questionnaire and descriptive analysis of the results) that support the findings of this study are available from the corresponding author upon reasonable request.

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