Board 39: The In/Authentic Experiences of Black Engineers

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Abstract

The computer and information technology industry has received much attention in recent years due to its lack of diversity and the toxic culture in these companies. The United States population is 13% Black, but this representation is not reflected in the technology workforce. In fact, fewer than 5% of tech company employees identify as Black. These factors lead many Black employees to leave, costing companies billions of dollars to fill their positions–not to mention their perspectives and expertise. The lack of diversity can also affect worker wellbeing, productivity, and innovation. To interrogate this issue, our study examines the experiences of Black engineers through their own narratives. We aim to interview 40 engineers within the technology industry to understand their working conditions. The interviews will be held with 10 each of: Black males, Black Females, White males, and White females, in order to attend to the intersectional nature of race and gender. Each participant will provide their own individual experiences, which will allow us as researchers to examine, compare, and contrast across all accounts. Specifically, we will conduct narrative analysis using three different frameworks: Faulkner's in/authenticity, Helms and Piper's pairing of racial identity theory and vocational psychology, and Kendi's history of racist ideas. Our findings will add to the depth of research on diversity by presenting our findings to stakeholders within the industry through different modes including presentations to industry leaders and at professional conferences. The end goal of this project is to create a more welcoming and diverse community within the computer and information technology industry.

Introduction

The computer and information technology industry has been under the spotlight in recent years for the reputation of toxic environments at many of the companies [1], [2]. According to analyses from the site *information is beautiful*, out of 23 different companies within the industry Amazon is the sole company with a workforce that meets and/or exceeds parity for Blacks (21%) in the US population [3]. According to Connor [4], "Black people and Latinos earn nearly 18% of computer science degrees but hold barely 5% of tech jobs…People of color who enter the tech industry leave the field more than 3.5 times the rate of White men." Companies have attempted to address the issue with minimal success. The *Tech Leavers Study* showed that for 37% of employees the primary reason for leaving their company was unfairness or mistreatment, and an additional 43% said it was a contributing factor [5]. Among people of color 40% of men and 36% of women left due to unfairness. However, simply increasing the numbers in the workplace of individuals from diverse backgrounds is insufficient. As stated by Chubin, May, and Babco, diversity is "an asset, an enabler that makes teams more creative, solutions more feasible, products more usable, and citizens more knowledgeable. Diversity arguably makes any profession, but especially science and engineering, more competent" [6, p. 73-74]. Work places dominated by White males produce an atmosphere centered around a "bro" culture. This atmosphere creates a sexist and gendered climate at work, with Black women being subjected to a double-bind with the layering of race [7]. To mollify the differences, Black engineers are described to put on and take off masks [8], [9] as needed to un/cover their authentic self and survive the culture of their workplace.

Inclusion goes far beyond the economic costs; it is a more significant issue of social justice. Riley, Slaton, and Pawley argued that social justice should permeate all aspects of engineering, and they recognized that a social justice orientation "could shift conversations about numeric representation to far more incisive discussions on power… with power relations made visible in this way, incidences of discrimination that have customarily gone unanalyzed may gain attention" [10, p. 336]. Slaton conducted a historical analysis of engineering educational institutions to show how power has been used to marginalize Black engineers in order for White engineers to maintain status quo with their education [11]. A similar history is witnessed throughout the computer and information technology industry.

The goal of this research is to investigate and understand the experiences of Black engineers at two levels: individual and structural. At the individual level, we investigate the specific strategies participants use to navigate the workplace and the impact this has on their wellbeing. At the structural level the policies and subsequent ideas, both explicit and implicit, that define what it means to be an engineer will be investigated [12]. The research questions that drive this project are:

- How do engineers view aspects of workplace culture affecting the extent to which they can authentically be themselves?
- How do engineers describe the manifestation of racist ideas in their workplace cultures?

We recently started this project and are in the process of refining our data collection procedures and protocols, thus, we do not yet have data. In this paper we describe the literature around this topic and our methodological approach.

Literature Review

Considerable research has been conducted on the experiences of Blacks in the workplace [13]–[17]. Studies have found that in their careers, Blacks need to reconcile existing within two cultures, their personal Black culture and the dominant White workplace culture [13], [14], [17]. As stated by Feagin and Sikes, "White workplaces rarely accommodate basic black interests and values. Instead, black employees are expected to assimilate" [13, p. 163]. Bell suggested that a way to handle the dichotomy is to compartmentalize the two cultures [17]. The arduous task of navigating between the two cultures can result in loss of identity and psychological stress [14], [17].

Intersectionality of race and gender have significant impacts for Black females in the workplace. This double jeopardy, or double-bind, has been studied by various researchers [18]–[20]. As an analytic tool, intersectionality [21]–[23] is used to examine the gap left by feminist and anti-racist critique and the failure to examine the multidimensional discrimination experienced by Black women. Women of color find it crucial to conform to male-oriented norms [7] in the workplace.

Specific to Blacks in engineering, little research has been conducted as noted by Ross [19], Hofacker [24], Gibbs [25], and Rice [18]. It was found that significant barriers exist for Black engineers, including: nepotism, cultural mismatch, perceptions of under-qualification, lack of peers, lack of overall workplace diversity and lack of support for minorities [18], [25]–[27]. In

order to combat cultural mismatch, personal agency is typically used. Ross [19] and Ross and Godwin [20] concluded that personal agency and support networks were the keys for the successes of Black women engineers. Ross stated that "If they knew that they were not fulfilled by their career alone, they sought opportunities to feed the part of them that needed nourishment. The majority of the women in the study possessed an incredible understanding of self that provided a guiding post for careers. This enabled them to seek opportunities that aligned with who they were and what they needed. If they had lacked this honest reflection they may have found their careers misaligned from their personal needs. This incongruence could lead to disengagement" [19, p. 298]. According to Gibbs, Black engineers expressed the need to outperform Whites by 3-5 times in order to be considered equally qualified [25]. Race and gender were the strongest predictors of inclusion, and perception of inclusion was the most significant predictor of job satisfaction and well-being [28]. Therefore, the intersection of race and gender can negatively impact the experiences of Black women engineers in the workplace.

Many studies, as cited above, provide insight to only parts of the experiences of Black engineers in the workplace. A critical aspect that is missing in previous studies is the examination of racism. Racism is the root of all racial barriers and negative experiences, yet it is typically not addressed directly in engineering education research. There is a considerable amount of work needed to fully comprehend the workplace culture and its impact. We are proposing to add depth to this body of research through narrative analysis of both the structural and individual racism affecting the experiences of Black engineers in the workplace.

Methodology

The narrative analysis approach outlined by Pawley and Philips will be implemented for this project [29]. Narrative analysis allows an in depth understanding of the stories about the participants' experiences. The study will be framed by complementary conceptual and theoretical frameworks. At an individual level, we will be using Faulkner's concept of in/authenticity [30] to understand how workplace cultures impact engineers' ability to be their authentic selves. At the structural level, we will be using Kendi's history of racist ideas in America [12]. In conjunction with this analysis, we will delve into the intersectionality of racial identity and vocation of each participant described by Helms & Piper [31].

Conceptual and Theoretical Frameworks

In/Authenticity. Many authors have described tensions that exist when Blacks are forced to exist in a cultural setting dominated by Whites. Bell named this phenomenon biculturalism, stating "A bicultural life experience can lead to an acute identity conflict" [17, p. 464, italics in original]. Anzaldúa described masks that people of color had to wear, saying that "the masks, las máscaras, we are compelled to wear, drive a wedge between our intersubjective personhood and the persona we present to the world" [8, p. xv]. Camacho and Lord extended this in describing how these "wedges" force Latina engineers to the professional borderland [32]. Ladson-Billings's work on culturally relevant pedagogy [33], [34] was grounded in the concept that "The dilemma for African-American students becomes one of negotiating the academic demands of school while demonstrating cultural competence. Thus, culturally relevant pedagogy must

provide a way for students to maintain their cultural integrity while succeeding academically" [33, p. 476].

Related to engineering and biculturalism, we have chosen to frame our research through Wendy Faulkner's concept of in/authenticity [7], [30], [35]–[37]. This concept was used to understand how women navigate the male-dominated culture of engineering. Faulkner first coined the term "gender in/authenticity" in a discussion of engineering dualities experienced in the software engineering workplace [35], [36]. She explained a division of engineering into the "technical" and "social" realms. The technical was seen as "real" engineering, where stereotypically men were expected to engage. Women were expected to engage more with the social realm. Faulkner continued this research and expanded on gender in/authenticity in later work [7], [30], [37]. Within many engineering firms she discovered that interactions were gendered leading some engineers, men and women, to feel as though they didn't belong.

With this framework, we intend to extend the concept of in/authenticity to race. We are focusing on the experiences of Black engineers. We will record the experiences of White engineers and contrast them with the experiences of Black engineers in order to identify experiences that cause in/authenticity.

History of Racist Ideas. Historical analysis is a way to examine and understand the structural issues in existence that affect diversity and inclusion. An example of this is Omi and Winant's analysis of the construction of race in the United States [38]. They depicted how race is constructed in order to create social distinctions and allow one group to dominate another. Slaton provided an example within engineering [11]. She compared histories of White and Black engineering schools to show how policies in different eras shaped unequal engineering education for Blacks and Whites. An understanding of the historical trends allows a focus on similar issues within current contexts.

We will frame our analysis of structural racism by using Ibram X. Kendi's *Stamped from the Beginning: The Definitive History of Racist Ideas in America*, which won the 2016 National Book Award for Nonfiction [12]. We chose this framework because of its critical analysis of the ways in which racist policies impact the perception of Blacks. We expect that at a structural level, the ideas that define the workplace culture of computer and information technology companies are what catalyze the in/authentic experiences of Black engineers.

Kendi posed a new relationship between racist ideas and policy. He defined a racist idea as "any concept that regards one racial group as inferior or superior to another racial group in any way. I define anti-Black racist ideas…as any idea suggesting that Black people, or any group of Black people, are inferior in any way to another racial group" [12, p. 5]. Typically, the relationship between racist ideas and policy is viewed as racist ideas → racist policies → advantage. Rather, Kendi suggested that it is desire for advantage → racist policies → racist ideas [12]. This means that racists policies are not put in place because people are driven by racist ideas. Racist policies are implemented because of a desire to maintain advantage, and the policies are then justified through racist ideas.

Kendi defined three stances on racial identity: segregationist, assimilationist, and antiracist. "A group we can call *segregationists* has blamed Black people themselves for the racial disparities. A group we can call *antiracists* has pointed to racial discrimination. A group we can call *assimilationists* has tried to argue for both, saying that Black people *and* racial discrimination were to blame for racial disparities" [12, p. 2, italics in original]. Thus, segregationists would say that Blacks are inferior. Antiracists would say Blacks are not inferior, and that racial discrimination has created inequalities. Assimilationists would say that Blacks are not naturally inferior, but circumstances have led them to be inferior. Assimilationists would also say that Blacks need to be "improved" to "fit in" to society, which is a racist idea.

Kendi did not frame his historical analysis as a theory for social science research, but we still see its value. We will use it to uncover the racist ideas that underlay the experiences of Black engineers in the computer and information technology industry. Broadly, we can see that in/authenticity results from the assimilationist racist idea that Blacks need to "fit in" to the workplace culture to be successful. Our analytical approach will consider both the racist and antiracist ideas that affect the experiences of Black engineers.

Intersectionality. The intersection of race and gender highly impact the experiences of Blacks in the workplace. Helms and Piper contributed to our understanding of intersectionality and how it manifests in career [31]. They paired theories of racial identity and vocational psychology in order to understand the development of identities that participants feel need to be masked. "Racial Identity theory deals with the processes by which persons develop (or do not develop) healthy racial collective identities in environments in which their socially ascribed racial group has differential access to sociopolitical power, which, in this case, means access to the world of work" [31, p. 125]. It is important to understand the development of identities in order to assess one's racial salience. As Helms & Piper stated "Race and racial identity need racial salience in order to be a crucial factor in individual vocational behavior. " 'Racial salience' can be defined as the extent to which a person conceives (correctly or incorrectly) of race as a significant definer of one's work options" [31, p. 129].

Context and Participants

The study will be situated within the computer and information technology industry. This industry consists of hardware companies such as Intel and Apple, software companies such as Microsoft and Adobe, and social platform companies such as Google, Facebook, and Uber. In order to attend to the intersections of race and gender, we aim to interview 40 engineers: 10 each that are Black men, Black women, White men, and White women. Participants will be recruited through snowball sampling, and by use of an industry contact who is a collaborator on the project. At the end of each interview, we will ask the participant for suggestions of additional people who might be willing to be interviewed. In hopes of increasing participation, we are intentionally not limiting to specific years of experience, companies, or sectors within the computer and information technology industry.

Data Collection

Data will be collected through two semi-structured interviews with each participant. They will be conducted and recorded virtually over Zoom. Although there is no time restriction on the interviews, we expect that they will last about an hour. Additional follow-up interviews will be scheduled as needed to clarify points or expand on topics discussed. Methodologically, we want to generate stories from the participants and draw out their narratives. Within the first interview, we will ask questions about their early experiences that led to the engineering profession. We will explore their grade school experiences, influential people, and other factors that may have shaped them.

In the second interview we will be interviewing the participants about their workplace experiences. The interview will begin with the question "Tell me what it is like to work in your company." From there, we will delve into their workplace experiences and explore their personal accounts. Other example questions in this interview include:

- In what ways does your professional identity overlap or diverge from how you view yourself as a whole person? What aspects are amplified or tempered at work? Why?
- What is the climate like for you in your job now? How has it changed over the years?
- How did you deal with the climate when you were first working? How do you deal with it now? How as your approach changed over time?
    - Why have you chosen this approach?
    - How effective has this approach been for you? What, if any, have been responses to this approach?

We are currently in the pilot phase of the project; therefore, the complete interview guide is being refined.

Data Analysis

Figure 1 outlines our data analysis process. We will use a multi-step process that incorporates Polkinghorne's criteria for narratives [39] and Doucet and Mauthner's Listening Guide [40], as outlined by Pawley and Phillips [29]. The Listening Guide approach suggests four readings through the data, although it "advocates a flexible approach to the number and types of readings that can be done, depending upon the nature of the topic under investigation" [40, p. 405]. Doucet and Mauther's [40] suggested readings are:

1. Relational and reflexively constituted narratives: Identifying the storylines
2. Tracing narrated subjects: Focus on the person and how this person speaks of him/herself and others
3. Reading for relational narrated subjects: Identify networks and social relationships
4. Reading for structured subjects: Identify "structured power relations and dominant ideologies" [40, p. 406]

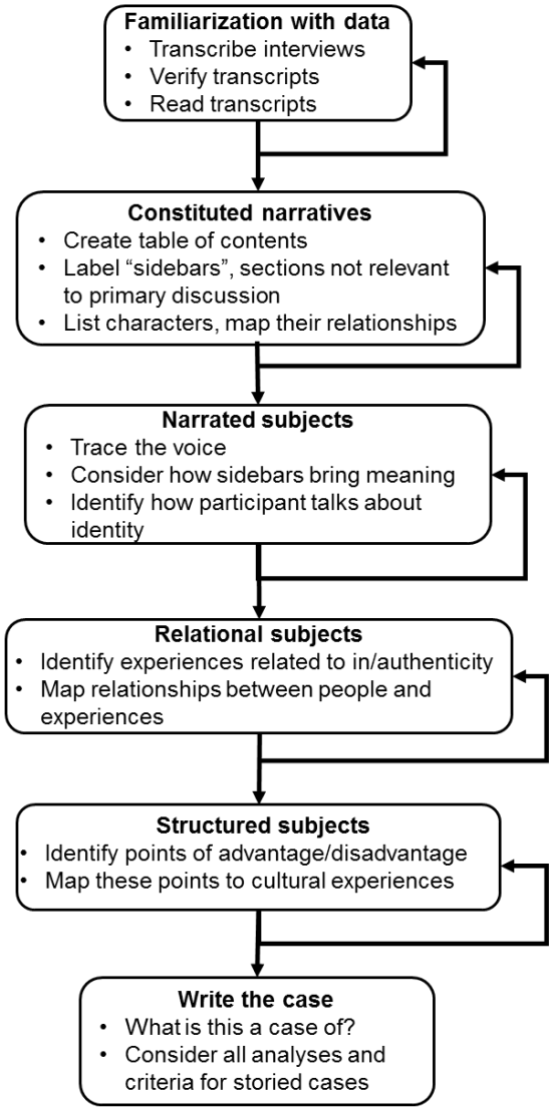

Figure 1: Overview of data analysis process.

During the analysis we intend to treat the interviews as individual cases, rather than collectively. We chose the individual approach because each participant brings forth their own unique experience. As stated by Polkinghorne, "Narrative cognition is specifically directed to understanding human action…Human action is the outcome of the interaction of a person's previous learning and experiences, present-situated presses, and proposed goals and purposes. Unlike objects, in which knowledge of one can be substituted for another without loss of information (as in replacing one spark plug with another), human actions are unique and not fully replicable" [39, p. 11]. Our goal is to relate the experiences and resulting meaning for each participant. We will attend to opportunities to compare and contrast the different experiences as we analyze the data and build the cases.

Following the process outlined in Figure 1, we will first transcribe and check the interview recordings for accuracy. They will then be read through multiple times to familiarize ourselves

with the content. The first analytical step corresponds to reading for relational and reflexively constituted narratives. A table of contents from the narrative will be created to identify the storylines. This will map the overall structure of the story(ies). Inevitably, there will be "sidebar" conversations that do not contribute to the primary story and will be labeled as such but not removed from the story. We will also create a list of characters and map the relationships between them. For example, there will be supervisors, co-workers, etc.

The next step is to trace the narrated subjects by following how the participant talks about him/herself and others. This will involve identifying instances of the words "I", "you", "they", etc. These will be examined for identities the participant talks about.

In the following step, relational narrated subjects, the transcript is read specifically through the lens of in/authenticity [30], [37]. We will highlight and document moments of cultural match or mismatch along with the participants' responses to them. We will attend to the participants' language used as a means to understand how in/authenticity affected them.

The next reading will use the lens of Kendi's concept of racist ideas to frame the structured subjects. We will identify instances of discriminatory actions that stem from efforts of one group to maintain an advantage over another. These points of dis/advantage will be examined to see how they are connected to racist ideas.

The final step in the data analysis phase is to write the cases of what is presented from each participant. They will be written as storied narratives that tie together all of the analyses conducted. We will ask ourselves, what is this a case of? For example, one case may be about empowerment and agency, while another is about stress and disengagement. As a guide, we will use Polkinghorne's [39] criteria for a narrative case study:

1. Include descriptions of the cultural context
2. "[A]ttend to the embodied nature of the protagonist" [39, p.17]
3. Consider how other people affect the central character
4. Identity choices and actions of the central character
5. Attend to past experiences and how they impact the choices and actions
6. Create a story with a beginning, middle, and end
7. The plot should bring all the data together into a meaningful story that explains why the central character acted the way s/he did

Quality Considerations

This project will be monitored by an external review board and an internal framework. Internally, we will use the Q^3 framework outlined by Walther et al. [41] and Walther, Sochacka, & Keller [42]. The Q^3 framework considers the stages of making data and handling data. The quality areas of the framework are process reliability and five aspects of validation: theoretical, procedural, communicative, pragmatic, and ethical. This framework provides questions to engage and guide the researchers in order to allow them to see what they think they see, ground interpretations in the participants' social reality, and provide findings that are relevant and

meaningful beyond the study setting. The Q^3 framework is not intended as a checklist, but rather a set of guiding questions to be used flexibly throughout the entire research process.

Positionality Statements

Our diverse research team helps us with reflexivity about our biases. Dr. Elliot P. Douglas, the PI on the project, is a White, male, engineering professor. Being a White male, he provides the "outsider" perspective that is not influenced by previous experiences of an underrepresented minority. Dr. Erica D. McCray, a co-PI on the project is a Black woman and associate professor in education. Her research takes a primarily qualitative approach to examining diversity issues and regularly employs race- and/gender-based frameworks. As the only Black faculty member in her academic unit, she is keenly aware of the importance of workplace culture and how intersectionality can affect personal and professional well-being and effectiveness. Gretchen A. Dietz is a White female graduate student in engineering. She brings insights to the experiences of being a woman in engineering. Dr. Erica D. McCray provides an "insider" view of the experiences of in/authenticity that might elude Dr. Elliot P. Douglas and Gretchen A. Dietz. Through this combination of insider/outsider perspectives, we can ensure that we privilege the voices of our participants.

Conclusions

The computer and information technology industry lacks diversity and inclusive workplace environments. To bring awareness to this issue, our study is examining the experiences of Black engineers. Currently, we are in the preliminary phases of this research which entails conducting pilot interviews and tailoring the protocol in order to elicit the strongest narratives for the study. We anticipate that instances of individual and structural racism will appear throughout the interviews, which will provide new insights into how engineers describe and are affected by workplace cultures. We will use the narratives shared to depict what is actually happening, in order to push attitudes towards cultural change, going beyond only changing the numbers associated with diversity in the workplace. The findings from this project will be presented to various computer and information technology stakeholders including executives and leaders. We intend to implement programs or resources to aid companies in their diversity and inclusion efforts and advocate a need for a shift in attitudes, behaviors, and policies. We hope increased awareness, discussion, lead to environments that foster and nurture diversity and inclusion.

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