Scientific Research Publishing

Journal of Human Resource and Sustainability Studies, 2023, 11, 827-845
https://www.scirp.org/journal/jhrss
ISSN Online: 2328-4870
ISSN Print: 2328-4862

Understanding Underprivileged Employee Advancement in Technology and Aerospace Organizations: A Structural Evaluation and Assessment for Professionals

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How to cite this paper: Gaynor, T. D., & McAdams III, A. (2023). Understanding Underprivileged Employee Advancement in Technology and Aerospace Organizations: A Structural Evaluation and Assessment for Professionals. *Journal of Human Resource and Sustainability Studies, 11,* 827-845.
https://doi.org/10.4236/jhrss.2023.114047

Received: October 24, 2023
Accepted: December 8, 2023
Published: December 11, 2023

Abstract

Many would assume in a technology management program; a student would decide to conduct research on something that is more tangibly connected to the field. With a less technical approach, this topic is based on how employees & leaders are selected and developed in technology and aerospace organizations. When navigating the application of knowledge for achievable practical goals in a reproducible way, many forget that those decisions are contingent to what superiors believe, think, or feel about those employees. In the field of technology management, technology advancement and aerospace, one would consider how employees are advancing, if those employees feel empowered in the industry and if decisions are fair and justified. With the products that are attached to the technology and aerospace industry, it's imperative that the investment of people in these respected fields is valuable. Evaluating a decision of bias on promotion opportunities will allow a greater understanding of value that is determined for employees in technology and aerospace fields. Those who are constituents of the aerospace industry, understand that the best work is done when the team feels appreciated, valued, and respected when producing a manufacturing aviation and technology products. The future of products we use today is contingent to how the creators and managers of those products feel daily. Examples of those products are airplane engines, AI software, cell phones, laptops/computers, GPS, electric vehicles, gasoline vehicles and much more.

Keywords

Underrepresented Minority (URM), Historically Represented Population (HRP), Equity, Diversity, Inclusion, Discrimination, Advancement,

Employee, Workforce

1. Introduction

This literature review was conducted by categorizing factors that showcase opportunities for growth and development in aerospace and technology industries though the investment of people and knowledge management. The literature was searched and sorted based on the following variables: aerospace/technology employee development, corporate innovation through employee advancement, organizational advancement through culture sustainability and enhancing organizational performance. These categories and understanding the positive and negative impacts of these variables curated an efficient sorting method to track qualified and relevant journal articles and literature. If scholarly articles obtained did not support the concepts around these variables, it would be understood that the literature did not speak to the heart of the topic for this review. Platforms that were used to obtain trusted, scholastic literature was science direct, sematic scholar and Google scholar.

Cultural development for employees starts from gaining a greater understanding of what is needed in their path to advancement. Common error that organization leaders forget to consider is the shortcomings one would encounter when making attempts to take their career to the next level. Some leaders clearly see the shortcomings and turn a blind eye to it. Others are genuinely oblivious to these inadequacies which naturally disable the continuous growth of business culture. Either way, these disadvantages can be used as an opportunity to educate the masses on how to use diversity, equity, and inclusion as a benefit for the organizational cultural development and employee advancement. The investment of employees is one of the most effective tactics for a sustainable business. Employees should feel empowered, regardless of physical appearance or the industry. Employee engagement is an important strategy which down the line could manifest into devotion, dedication and true commitment to the mission and goal at hand (Dhir & Shukla, 2018; Eppinger & Browning, 2012).

Technology and Aerospace companies are the face of future automation and telecommunication advancement. Studies have shown that technology companies today are a driving force of increased employment due to such bountiful salaries and lucrative benefit packages. These factors would convince any average individual to make valiant efforts to take advantage. Considering that, one would wonder, what are the characteristics and traits a candidate would have to possess to be deemed a valuable employee (Abejirinde & Anele, 2021). Many organizations and businesses today are building their cultural Rapport in the community by creating a diversity and inclusion department but not truly supporting those employees that would be considered the minority. These tactics speak to the lack of effective organizational leadership and how that is transcended into limited effective organization behavior. As we continue to think

about this, a huge concept to consider is if there is a threshold of obtaining employment into these industries which further contributes to a better diversity, equity and inclusion endeavor and how is that measured.

2. Overview

Literature regarding the advancement of minorities in the technology and aerospace industries is sporadic. Minorities in aerospace and technology experience diverse challenges ranging from access of education to slow career advancement. Literature on these challenges exists but leaves gaps with insufficient knowledge and information. The term underrepresented minority (URM) or historically underrepresented population (HUP) has been used to identify individuals in the American population who are poorly enrolled in education and industry compared to other groups (Nathan, 2014). The term minority in this proposed study is used to refer to groups of people who are at a disadvantage (gender, ethnicity, socio-economic status). The aerospace industry has expanded over the last few decades, and the employees in this field have become numerous. However, some barriers still hinder minority groups from thriving in the field. Many would say that diversity and inclusion exist in lower employment positions. However, the top executive positions are still occupied by mostly Caucasian males who dominate the aerospace industry (Brown, 2018). Diversity and inclusion in the science, technology, engineering, and mathematics (STEM) industry have historically fallen behind in other careers. Industries such as aviation have suffered tremendously due to virtually zero diversity among professional pilots (Ison, Herron, & Weiland, 2016).

In evaluating different aerospace industries reports, an industry-wide adaptation of the matrix management structure ensures efficient program execution (Dehoff, Dowdy, & Niehaus, 2013). Organizations operate through a matrix structure where work is compartmentalized according to contracts, and work teams are built on contractual needs and team interpersonal requirements. The matrix management structure was initially introduced in the 1960s within the aerospace industry. This management style proves to derail career advancement, especially for minorities. Conducting more research, mentorships and sponsorships for minority groups offer better results regarding a positive trajectory in individuals' career paths.

A mentor is someone who offers help or advice and teaches a less experienced individual in a particular role (Cline, 2018). Prior studies have mainly focused on well-represented populations in STEM, but a gap remains in understanding how these experiences contingent to environment and up brining may be different. There is extensive literature on the benefits of minority participation in the workplace and education, especially within the STEM sector (Ison et al., 2016). This literature outlines the advantages of diversity, including positive working environments, better learning atmospheres, and increased competitive advantages (Fine, Sojo, & Lawford-Smith, 2020).

Transformation leadership is an attribute that many aerospace and technology organizations desire to gain. Such an attribute showcases that the organization or business is constantly and consistently making innovative decisions based on regular adjustments and endless adaptability to change. Transformative leadership is something that could only be achieved by diversity (Abejirinde & Anele, 2021). Regardless of if current professionals are prepared for such harsh truths, the facts still stand. Regular business advancement lies in the hands of the organization that can retain the flexibility of transformative leadership. Worlds common theory states that businesses are more effective with men in leadership vs women. Studies and research show that there are positive trends in addressing gaps in analyzing concept around women development and leadership specifically in the aerospace industry (Garrett-Howard, 2012).

2.1. Workforce Diversity

The foundation of this research exists in understanding what diversity is and how it presents itself in the workplace. Workforce diversity refers to employees' similarities and differences in age, cultural backgrounds, physical abilities, disabilities, religion, gender identification, and sexual orientation (Hudson Jr., 2014; Wentling & Palma-Rivas, 1997). Diversity ensures that the workforce within an organization is heterogeneous. As crucial as diversity is today, many managers and leaders find it difficult to navigate (Byrd & Scott, 2018). Kim Cho highlighted that for an organization to thrive in a cut-throat competitive market, it requires hiring an efficient labor force to promote competitiveness (Cho, Kim, & Mor Barak, 2017). It is also important to note that organizations that employ qualified candidates to a competitive workforce regardless of age, attitude, language, gender, or religion can have grounds compete in that respective marketplace (Wentling & Palma-Rivas, 1997). Workforce diversity also includes the co-existence of employees from various socio-cultural backgrounds within an organization. These differences include factors such as race, gender, age, color, ethnicity, and nationality (Wentling & Palma-Rivas, 1997). Workforce diversity thrives in an organizational environment where all employees can experience upward career mobility without restrictions on gender, race, nationality, religion, or other factors that are not directly associated with their performance. When a company/organization can manage diversity, they ensure their workforce performs optimally in a fair working environment where no group is at a disadvantage (Torres & Bruxelles, 1992).

The United States (U.S) represents the most significant sector in the world's aerospace market. According to the Aerospace Industry Report of 2016, the U.S. aerospace and defense (A & D) industry generated $300 billion in economic value, representing 1.8% of the country's total nominal Gross Domestic Product and 10 percent of the manufacturing output (Materna, Mansfield, & Walton, 2015). However, despite the industry's success, it is affected by the lack of diversity in the executive leadership positions.

A diverse workforce in the U.S. aerospace industry contains over 500,000 workers receiving roles in scientific and technical occupations and supporting over 700,000 jobs in related sectors. Diversity plays a key role in enhancing business performance, with firms reflecting their employees and clients in their executive positions and achieving higher performance results (Carmen Diaz-Fernandez, Rosario Gonzalez-Rodriguez, & Pawlak, 2014). A lack of diversity within an organization can result in unhealthy business environments, especially for those who felt like they did not fit in (Ely & Thomas, 2020). Over the past several years, U.S. corporations have felt a rise in population and labor force diversification. Statistics from the 2010 U.S. census indicate that at least 36.3% of the population are members of a racial or ethnic minority group: Native American or Alaska Native, Asian American, Black, or African American, Hispanic, or Latino, and Native Hawaiian or Other Pacific Islander (Johnson, Hayes, Brown, Hoo, & Ethier, 2014).

The Asian workforce was expected to grow rapidly over the next forty years, adding approximately nine million people to the workforce (Toosi, Sommers, & Ambady, 2012). From 2010 to 2050, the number of African Americans in the labor force is projected to increase by 6.4 million. Persons of Hispanic descent were predicted to introduce 37.6 million employees to the workforce between 2010 and 2050, considering over 80% of the workforce's development (Toosi et al., 2012). Between 2010 and 2050, the workforce classification "other," which includes people of various races, Native Americans and Alaskan Natives, Native Hawaiians, and other Pacific Islanders, are expected to grow by 58 million (Toosi et al., 2012). The Asian Pacific Islander and Hispanic-origin populations were predicted to grow at rates greater than 2% each year until 2030 (Budiman, Cilluffo, & Ruiz, 2019). According to Toosi, women, ethnic and racial minorities will continue to expand through 2050. Even though personnel pools are getting increasingly diverse, senior-level occupations are still untouched. At the rate, levels of the workforce, executive-level roles do not represent diversity as vast as they should.

Diversity policies will be unsuccessful if it is not executed together with the inclusion policy. Workforce diversity has the capacity to create an impression of impartiality, where high-status employees' impressions of how impartially members of a disadvantaged group are treated may be impacted by the existence, not the effectiveness, of a diversity structure (Kaiser et al., 2013). Many claims were raised about the significance of racial, ethnic, and gender diversity in corporate executive leadership teams. However, when requested to offer examples, many organizations admitted the difficulty of illustrating the theory in this practice (Turi, Khastoori, Sorooshian, & Campbell, 2022). Diversity and inclusion are critical complementary aspects of positive corporate performance in business.

Many associations have made deceptive statements about diversity and inclusion on their websites, in commercials, and in the media that a pledge or real-life instance could not support. Studies have shown that more diverse teams typical-

ly outperformed homogeneous group (Ely & Thomas, 2020). The United States aircraft sector failed to foster diversity at its organization's highest levels, hampered its growth while preserving worldwide economic competitiveness. The rise in workplace diversity without a commensurate increase in diversity at the executive management level has a negative impact on the corporation's performance (Ely & Thomas, 2020). The variety of perspectives provided to firms, ethnically and gender-diverse organizations were more inventive, creative, faster to market, and more profitable (Turban, Wu, & Zhang 2019).

The absence of diverse representation leads to a lack of optimal company performance since the contributions of the full workforce are not utilized. To a large extent, variety increased originality, improvements, and better decisions, leading to results in increased competitiveness (Mannix & Neale, 2005). Securing and retaining a diverse workforce was critical to influencing the talents of all workers and speaks to competition in a global economy (Roberson, 2019). Organizations with more diverse top management teams tend to achieve in financial performance. Multicultural groups had a great deal of material that supports scenarios that deal with complicated organizational encounters. This further provides a wide range of working styles to develop better approaches for applying resolutions (Lane, Maznevski, & DiStefano, 2000). Regardless of the flaws, diverse top management teams possessed dominant, aggressive, and versatile competencies (Hambrick, Cho, & Chen, 1996). Diverse executive leadership teams gained a better understanding of their client base and the environment in which the business operates, resulting in improved understanding and the executive leadership teams being better prepared to discover and seize opportunities for advancement.

2.2. Aerospace/Technology Organization Management

The Deloitte Study of 2015 indicated that while there are slow growth prospects (less than 3%) over the next ten years for the domestic portion of this sector, there are significant prospects (more than 10%) for expansion in international markets (Dixit, 2016). This perspective and information offers various opportunities affecting culture and develops a more inclusive management and leadership team, thus better exploiting emerging overseas opportunities. Reports in the past have highlighted similar industry transition opportunities due to domestic and international clients and similar compulsions to change the existing leadership ranks.

There was an industry-wide adaptation of the matrix management structure, which ensures efficient program execution (Dehoff et al., 2013). The organizations operate through a matrix structure where work is compartmentalized according to contracts, and work teams are built on contractual needs and team interpersonal requirements. The matrix structure of management was initially introduced in the 1960s within the aerospace industry (Dehoff et al., 2013). NASA pioneered this structure, mainly built around challenges and projects in which the organization is involve (Cooper, 2016). These problems and projects

are usually presented as the rows of the matrix. In the aerospace industry, the structure has been used to manage complex projects with numerous stakeholders. This structure allows the integration of various departments, including engineering, manufacturing, and marketing into one project team (Eppinger & Browning, 2012). The structure allows easy coordination and communication between the various departments, thus allowing project completion.

The matrix organizational structure is very common in the aerospace sector and is characterized by employees having two managers/supervisors. The administrative manager determines employee raises and promotions, while the work supervisor oversees the day-to-day execution of assigned tasks. This management structure can result in supervisory dysfunctionality, where those who are responsible for supporting and managing employee growth, are simply not aware of employee development and performance. In a study on Asian American engineers in Southern California, it was established that most firms used this organizational structure where they relied on work-supervisor feedback as opposed to firsthand observation. Dixit noted that this approach is more laid back, and employees tend to drift through assignments due to managers being loosely responsible. Asian American engineers tend to work better with more structure and more intimate relationships with supervisors; thus, the matrix structure is unfavorable. In the engineering sector, mainstream engineers (typically Caucasian males) occupy power seats and have control while the URM engineers settle as knowledge/information resources (Dixit, 2016).

In summary, the aerospace industry is characterized by competitive organizations that employ much talent and operates under a matrix structure. Moreover, the sector is moving from a domestic-only model to a combination of domestic and international customers, thus offering an opportunity for change.

3. Underprivileged Aerospace/Technology Employees

The term, underrepresented minority (URM) or historically underrepresented population (HUP) has been used to identify individuals in the American population who are poorly enrolled in education and industries compared to other groups (Nathan, 2014). Over time, this term has become more inclusive and in the context of this research, refers to women and ethnic minority communities in the aerospace industry.

Records have shown that diversity and inclusion in the science, technology, engineering, and mathematics (STEM) industries have historically have not been a priority. Careers such as aviation have suffered tremendously, with virtually zero diversity among professional pilots. While the population landscape in the United States has been constantly transforming, the diversity levels in the demographics have continued to accelerate rapidly over the last few years (Halaweish & Alam, 2015). The 2010 census report indicates that the number of Caucasian Americans, stood at 75.1% in 2000, but by 2010 it had dropped by 2.7%, reaching 72.4%. In this same period, African Americans, Asians, and Hispanics experienced population increases of 0.3%, 1.2%, and 3.8% respectively

(Halaweish & Alam, 2015). According to the U.S. Department of Labor, approximately 23% of the population will fall in the minority category by 2024. Caucasians are anticipated to represent 75% of the labor force, while African Americans will rise from 0.6% to 12.7%. Asian Americans will rise from 1% to 6.6%, and the rest of the groups will rise from 0.5% to 3.7%. Diversity and inclusion will continue to slowly permeate into various facets of American society, from increased participation in the labor force to majority levels of education. From 1990 to 2010, the Caucasian workforce grew by 16.4%, the African American workforce grew by 30%, and the Asian one grew by 55.8%. The Latino workforce tripled in this period (Halaweish & Alam, 2015).

Over this period, female participation in the labor force increased by 26.5% versus a rise of 18.8% among men (Toosi et al., 2012). In the education sector, the numbers also reflect the same as similar trends have been identified in higher education institutions. Between the years 1961 and 1984, the percentage of Black students rose from 2% to 10%, and the Caucasian students' percentage decreased from 97% to 86%. In 1961, female students comprised 44%; in 1984, this percentage rose to 52%. The period between 1988 and 2008 saw an increase in percentages, with an increase in overall enrollments by 31.7%. Caucasian Americans showed a 14% increase, while African Americans recorded a 55.2% rise. Hispanics recorded a 74.4% increase, and Asians had a 37.4% increase (Toosi et al., 2012).

Despite these improvements, there are still some fields and study areas where minorities have been historically underrepresented and participation growth rates have lagged. When exploring this subject even further, fewer minorities participate from the aerospace industry. In the aviation industry, it is evident that minority participation by aircraft pilots is diminutive and virtually nonexistent (Ison et al., 2016).

There is extensive literature on the benefits of minority participation in the workplace and education, especially within the STEM sector. This literature frameworks the advantages of diversity, including positive working environments, better learning environments, and increased competitive advantages (Fine et al., 2020). The significance of diversity has received backing from the federal government and the justice system in the United States. In 2003, the U.S. Supreme Court ruled in Grutter v. Bollinger that due to the positive effects of diversity, efforts to ensure increased access to school by minorities deserve affirmative action (Fine et al., 2020).

Much like other STEM fields, aviation has had minimal participation of minorities, especially professional pilots. In fact, U.S. airlines have employed mostly Caucasian males, and it is still the case that White males dominate the management and piloting ranks of the industry (Ison et al., 2016). The whole aviation profession, not only airlines, has minimal participation by non-Caucasian and non-male employees (Ison et al., 2016). According to labor statistics 2011, at least 121,000 people were employed as aircraft pilots. Of these, 4.3% were female, 2.9% were African American, 2.4% were Asian, and 3.9% were Hispanic. By

2015, statistics showed that these percentages fluctuated, with women getting 9.4%, African Americans dropping to 2.6%, and Asians. Overall, assert that there is no direct measure of minority participation within the aviation labor force.

The study by Ison et al. (2016) sought to quantify the participation of minority groups in professional aviation and their trends over the last ten years. This study highlighted that within collegiate flight programs, minority groups, including women, comprise 27.3% of the student percentage (Ison et al., 2016). This percentage exceeds minorities' participation rate of 18.4% within the aviation profession. Since there is a positive trend, these improvements can be reflected in the professional community. However, it has been noted that the improvement pace is slowing, and since 2004, the data has become less impressive.

4. Scholarship & Sponsorship Opportunities

A mentor is someone who offers help or advice and teaches a less experienced individual in a particular role. Mentoring can be deemed as something different from training, teaching, or coaching since a mentor does not particularly have to be a qualified trainer or an expert in the technical aspects of a career (Durbin 2016). A mentor must be able to listen and inquire on matters that can challenge the mentee to figure out the course of action they should take regarding their development. On the other hand, a sponsor plays a different but complementary role. A sponsor's role is to advocate for their proteges and help open doors for them, thus offering visibility and ensuring others can see their capabilities and potential for career progression (Cline, 2018). Sponsors play a significant role mostly in women's career advancement. However, limited data exists from URM STEM students concerning their mentorship experiences and preferences. There are very limited studies which showcase the impact of having mentors from the same ethnicity and gender, especially for female students of color. Prior studies have mainly focused on well-represented populations in STEM, but a gap remains in understanding how the two may be different.

Since 1978, Aerospace has been part of the Consortium for Graduate Degrees for Minority Engineers (GEM). This national program seeks to support URM students in their master's and Doctoral levels within engineering and science (Estrada et al., 2016). Currently, almost forty employers and more than one hundred universities are participating in GEM. This 40-year partnership attracts diverse scientists and engineers who seek to advance degrees and impact this sector (Lopes, Durbin, Neugebauer, & Warren, 2015). The GEM alum group mentors and leads a significant group of scholars. It has been a great tool in increasing the diversity at the master's and doctoral levels within the STEM sector (Durbin, Lopes, & Warren, 2020). The GEM program is valuable in the transition of top diverse graduates in Aerospace. The program has commenced more than 4000 researchers, professors, entrepreneurs, investors, and businesspeople who mentor and encourage younger generations of professionals in STEM (Estrada et al., 2016).

In following aerospace and aviation career paths, women entering this field

are claimed to be "masculine" and seen as tough, difficult, and dirty, thus unsuitable for females. With this understanding, there is a great need to retain, nurture, and develop women who decide to ignore this baseless theory and enter this career path. This is specific for those who develop important tacit knowledge and experience (Bell, Tannenbaum, Ford, Noe, & Kraiger, 2017). Organizations can support their female professionals through mentoring, as this will ensure their recruitment and retention in this industry. Research shows that the help of a mentor is crucial for women at all phases of their careers but most importantly, in their career advancement (Cooper, 2016). Mentoring is also a channel for exchanging tacit knowledge and information often linked with promotion opportunities (Durbin et al., 2020). For women, mentorship is crucial as it may assist them in breaking through the "glass ceiling". Mentorship and sponsorship also help increase women's visibility within an organization and raise their aspirations and confidence (Ferla & Graham, 2019).

However, mentors are hard to attain male-dominated industries for women. It is considered more difficult for minority women. Historically black colleges and University's provide mentorship in a caring institutional setting (Atkins et al., 2020). These institutions ensure that students share academic, social, and cultural experiences among themselves and with faculty mentors in arranged meetings. The mentorship programs happen through a faculty network or family members with similar interests, such as student retention and academic success. Students perceived the mentorship program components to have an impact on their academic development and scholastic advancement. According to Atkins, there were several factors that helped students steadily improve their academic performance in STEM topics throughout the semester. In these studies, students claim mentoring was the most important supporting factors in their academic success. Student surveys on the effectiveness of faculty mentoring indicated a strong correlation between academic performance and how much students viewed mentoring as a learning experience. This study lends support to the notion that effective mentoring can boost academic attainment. Students often perform better academically when they are taught in encouraging environments.

In 2007, a partnership between the National Aeronautics Space Administration (NASA) and the Federal Aviation Administration (FAA) sought to improve participation in STEM education. This partnership specifically stated, "two organizations who share a common and critical goal of cultivating diversity, will sustain workforce environments that will develop, manage, and operate the next generations of air traffic and transportation system" (Murillo, 2020) Minority Serving Institutions (MSI) Intern Program|Federal Aviation Administration, n.d. An intern program by the FAA offers support to minority students by providing students from Historically Black Colleges and Universities, Hispanic Serving Institutions, students in colleges or universities with a significant percentage of Asian Americans and Pacific Islanders, Tribal Colleges and Universities, and Students with Disabilities the opportunity to participate in internship ventures throughout the United States.

The FAA also offers a program that assists students from the Native American/Alaska Native (NAAN) community as they pursue undergraduate and graduate programs. The students receive a stipend, travel fees vouchers, housing support, and incidental expense coverage. The FAA agreed with the Organization of Black Airline Pilots and the International Black Aerospace Council to offer support to the organization's different programs (Kraus, 2010). Many aviation minority organizations have emerged, and they all promote the participation of the individuals they represent in the aviation industry. The Organization of Black Aerospace Professionals (OBAP) has various education programs and as stated earlier, receives support through partnerships with the FAA (Opengart & Ison, 2016).

Another notable program is the Women in Aviation International (WAI), which helps women participate more in the aerospace industry through attending conferences, mentoring opportunities, and scholarships (Lutte, 2019). Women are underrepresented in the aviation industry, with trends showing that minority women are close to minimal in the industry (Halleran, 2019). The Hispanic Professional Pilots Association aids students from the Latino community as they seek to enter the aviation industry. This literature identifies several organizations that offer scholarships and other support systems for minorities pursuing careers in aviation and as aircraft pilots. Examples include the William Randolph Hearst Endowed Scholarship for Minority Students and the Women in Aviation, International Available Scholarships. Some corporations have adopted promotions of diversity in various forms. An example is Delta Airlines, which partnered with Western Michigan University to train minority pilots. Also, United Airlines and UPS indicated their commitment to providing minorities with employment and advancement opportunities in the corporations (Harper, 2015).

5. Aerospace Employee Development

Employee development refers to the practice of learning fresh skills and sharpening the current ones (Bin & Shmailan, 2015). With the help of employers, employees can take time to learn using new technologies tools and applying new techniques, develop their skills within an industry, and develop their competencies in various areas. Employee development is crucial since employers require highly skilled employees and those who want to succeed. According to Bell, employee development has three areas: experience, exposure, and education. Experience refers to on-the-job experiences that may assist employees to grow, such as special products and mentoring (Rodriguez & Walters, 2017). Exposure is learning through observation, for example, seeking feedback and networking. Education, on the other hand, is structured learning through coursework and reading books (Jayathilake, Daud, Eaw, & Annuar, 2021). An employee development technique incorporates these three aspects and offers a holistic path to growth, resulting in well-rounded employees.

The aerospace and defense (A & D) industry, which depends on the most advanced technology and scientific knowledge, is appropriate to emphasize seeking top digital talent (Gellis, 2021). Sector executives understand that developing and using new skills in advanced analytics and other quickly expanding technology is essential for the sector's competitiveness in the future. However, there is a widening mismatch between the demand for and supply of digital talent. The A & D sector faces competition from a broadening range of employers that are also becoming more interested in digital talents, such as major technology businesses, start-ups, and blue-chip corporations (Kassotaki, 2019). As a result of the increased rivalry for talent, A & D directors are making audacious moves to entice the top candidates.

A & D firms have fewer personnel with digital and analytics expertise. Only approximately 30 to 43 percent of their employees fit this description, compared to 62 percent at tech firms (Cooper, 2016). A & D faces greater competition for digital expertise, particularly from I. T. firms. Almost half of the poll respondents name technology and advanced-electronics firms as their top competitors for personnel, highlighting the growing overlap between capabilities necessary in the tech industry and those required in A & D (Kraus, 2010). A & D has to do more to highlight the industry's strengths. Many prospective employees consider the industry not providing enough exciting prospects and growth opportunities. Overall, 39 percent of survey respondents feel that delivering interesting careers is the most difficult barrier to developing and retaining talent (Bell et al., 2017).

The Aerospace Corporation offers employees various continuing education opportunities to assist them in growing professionally. This corporation offers industry conferences, professional courses, and classes. Apart from tuition reimbursement for approved work-related programs, Aerospace provides internal resources like professional development courses and technical classes that offer knowledge required to continue education within the industry. The Aerospace University (A.U.) offers most professional development courses and resources. Since its establishment in 1944, the university has offered professional excellence and productivity while accommodating individual career and organizational objectives. The university also offers workshops and seminars on leadership, personnel development, and financial planning.

6. Innovation and Contributions of Invested Employees

Although the aerospace business has been functioning for more than a century, it is still one of the sectors constantly inventing new technologies. Digitization, automation, and enhanced maintenance have mostly pushed the business in recent years (Cline, 2018). The COVID-19 crisis has damaged aerospace, as it has most other industries, and it is still uncertain how much and to what extent it will be harmed in the long run (Block & Keller, 2015). Nonetheless, there are key trends and developments that will shape or are currently influence of the sector. From automation to novel material solutions and even urban air mobility, there

are various fascinating developments that will impact not only the industry but everyone's daily lives (Goy et al., 2018). The Aerospace Industry report indicates that the defense sector in Southern California has characteristics of innovation and pragmatism. According to Jewel, innovation is the sense that most of the extremely challenging national defense issues are investigated and can be solved by the many engineers and their inventiveness. Pragmatism is the sense that the sector is practicing a for-profit business model.

Minorities have contributed greatly to the aerospace industry, and their history is long and complex, filled with struggles and triumphs. African American trailblazers have made significant strides in aerospace as innovators, leaders, pilots, and engineers. There are black men and women who dared to dream despite the numerous obstacles that could hinder them. According to Gompers, in 2017, First Officer Dawn Cook discovered that Captain Stephanie Johnson made history as Delta Airline's first black female pilot, and she immediately sprang into action. At the end of Black History Month, the two women of color took over the flight deck in a transformative moment, becoming Delta's pioneers in mainline flights with two African American female pilots (Gompers & Wang, 2017). Their deep love for aviation, determination to succeed, and the need to prove that African American women were quite capable, just like other pilots when taking the skies. In 2022, Anya Kearns emerged as the youngest African American pilot to fly for Delta Airlines. In the same light, Caleb Smith made history as the youngest glider pilot in the United States at just sixteen.

In tech, there are notable minority individuals whose impact has been felt over the decades. Kimberly Bryant is an electrical engineer who worked for Genentech and Pfizer's biotechnology business, an organization people might have never heard of until recently (Hofstra et al., 2020). Kimberly's most known achievement is being the founder of the Black Girls Code. This charity seeks to empower young minority girls and offer them the knowledge, experience, and expertise to join historically white, male-dominated STEM fields (Goy et al., 2018). Another trailblazer in tech is Felicia Hatcher, who used her influence to encourage individuals from poor socio-economic backgrounds and those with below-average grades to pursue STEM courses. Her campaign seeks to eliminate the perception that one must be an A student to pursue STEM careers (Hofstra et al., 2020).

7. Socio-Economic Status

Entry level positions in aerospace and technology would require an extensive evaluation of a candidate's educational background in confirming if one is qualified for a specific role or position. Aerospace, aeronautical & technology organizations, and companies typically present to be open to presenting an opportunity to college graduates only if they could determine the advancement of their future based on how well they navigated and excelled in their educational endeavors. Job placement and employee status is the basis for necessity in this country. Individuals raise their families and train their children to understand that lucra-

tive employment is sustainability for an effective and efficient lifestyle. Consider some of the common facts. High school students are encouraged and motivated to attend to college in order for them to attain an education (Ogbu & Simons, 1998). Obtaining that education is supposed to further solidify the most effective starting point of career path. One of the questions that many don't ask is, "are we all at a fair starting point in life"? The child who was born into two parent, middle/high class family and was able to receive what some would consider the most effective tools during his/her childhood would be deemed the child that had a head start versus the child that was born to a low-income single parent family and attained the bare minimum of tools to gain an effective education from grades K-12. Studies have shown that there is a disconnect between what underprivileged employees are receiving in the workforce in comparison to those who are considered privilege (Davis, 1946). Underprivileged is known as the minority class in a collective of individuals. With this understanding, organizations and business should consider advancing specific populations of employees over those who gained a more privilege advantage (Bir & Ahn, 2019).

Socio-economic background significantly affects career and education advancement, especially among minorities. The STEM sector has experienced major growth over the last few years, resulting in stable and rewarding careers. Therefore, STEM education can facilitate positive economic mobility for Americans with a low socio-economic (SES) background. However, research indicates that students from such backgrounds are less likely to continue post-secondary education, particularly showing low engineering program enrollment (NCA, 2019). When learners from underfunded backgrounds enroll in engineering programs, they still face various structural challenges that result in unfair outcomes, like the decreased transition into engineering careers, poor academic achievement, and lower graduation rates (Brown, 2018).

A study by Bir included SES as an independent variable as they analyzed aerospace student outcomes, gender, race, first-generation status, measurements, rest of skills, and capabilities, including high school coursework (Bir & Ahn, 2019). The study categorized students' financial capabilities from one to seven. However, there was no significant effect on aerospace student persistence after their first year, nor were their academics at risk. The study showed a small inverse effect, indicating that decreased financial means resulted in higher academic at-risk status but also greater persistence. However, the results were statistically insignificant.

According to Wingate, students from poor socio-economic origins struggled more in calculus and early aerospace subjects, drop out at faster rates, and have lower 6-year graduation rates than students from upper socio-economic backgrounds. These University admissions standards assume that students have an efficient math background. Students from low-income families obtain financial aid through the Pell Grant and other state subsidies (Wingate, Johnson, & Brooks, 2022). Despite this, the literature demonstrates that financial constraints are significant impediments to academic performance for low-income children.

These students must spend more time that the average to acquire a sustainable and substantial living.

8. Conclusion

The literature review consisted of a foundational review regarding the advancement of minorities (HUPs and women) in the aerospace and technology sectors. Building on this foundation, the literature review focused on current findings on workforce diversity, employee development, organization management, and innovation contributions of minorities in the two fields. Regarding the diversity in the workforce, there are significant changes with the industry employing more minorities. However, there is still a need for change in top executive leadership roles where minorities are still severely underrepresented. Despite the increased diversity in the industry, minorities still do not occupy a wide share of the top leadership roles. Despite many corporations presenting a picture of inclusion and diversity on their websites and in the media, most have not fully embraced the phenomenon, thus putting minorities at an unfair advantage.

Turning to research on mentorship and sponsorships of minorities in the aerospace fields, this proposed study identifies various mentorship programs that aid minority students (Cline, 2018). These groups guide the next generation of professionals and ensure they are equipped with skills, expertise, and knowledge. Despite the availability of these programs, a gap remains in sponsorships and mentorships for women of color (Durbin et al., 2020). Many individuals alluded to feeling more comfortable when dealing with mentors who can relate to their struggles and triumphs, such as racial injustices or discrimination. This experience becomes more intimate as one feels more understood.

The research will go on to identify the innovations and contributions of minorities in advancing the technology and aerospace fields. Women and HUPs have contributed greatly to these fields, and their innovations remain impactful. However, despite their significant contributions, their development in these fields is still inhibited by various barriers. Socio-economic status did affect the persistence and graduation rates of engineering students. However, the numbers were insignificant for it to be considered a factor derailing the advancement of minorities in the aerospace and technology sectors.

Finally, studies show the career progression of minorities within leadership and management roles as less linear compared to most White males. Career development and mentorship recommendations are crucial as they will propel minority professionals toward positive career advancement.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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