

WIP: Diversity, Equity, and Inclusion: A Systems Design Viewpoint

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Abstract— This research WIP paper focuses on diversity, equity, and inclusion (DEI) and their variations, which may include social justice. These concepts have evolved from a focus on compliance to a strategic-level effort by organizations, demonstrating their positive impact on overall performance. DEI are critical components of a healthy and successful organization. A systems design viewpoint of DEI recognizes that DEI is not just a program or initiative but is instead an ongoing process that must be integrated into all aspects of an organization, from its policies and practices to its culture and values. Integrating the topic into the curriculum has also received considerable attention from researchers, and it seems that it will also become a part of the ABET accreditation process. This paper will include a short literature review of the topic in academia and then focus on examining it from a systems design perspective. Applying this methodology, we will treat diversity and equity as a required "function" and identify appropriate "dependent" and "independent" inputs.

Keywords—Diversity, Equity, Inclusion, Systems Design

I. INTRODUCTION

Diversity, equity, and inclusion (DEI) have become critical topics in academia, prompting extensive research and discussion on their significance. DEI has become a critical pillar in the landscape of higher education, driven by a complex interplay of historical contexts, legal precedents, and ongoing scholarly debates. The commitment to DEI within academic institutions is not merely a recent development but a culmination of efforts spanning over a century aimed at addressing and dismantling systemic inequities that have historically marginalized certain groups. Historically, the pursuit of DEI in higher education can be traced back to the civil rights movements of the mid-20th century. Landmark legal precedents and policy formulations have significantly influenced the trajectory of DEI within higher education. Noteworthy among them are U.S. Supreme Court cases—such as *Brown v. Board of Education* (1954) [1], *Civil Rights Act of 1964* [2], *Title IX of the Education Amendments of 1972* [3], *Regents of the University of California v. Bakke* (1978) [4], *Grutter v. Bollinger* (2003) [5], and *Fisher v. University of Texas at Austin* (2013 and 2016) [6]–[7]—have addressed critical issues surrounding segregation, affirmative action, and race-conscious admissions policies. These judicial rulings, alongside pertinent federal and state legislation, have delineated the contours within which academic institutions navigate the implementation of DEI initiatives and further

reinforce the legal framework supporting equity and inclusion in academia. In the following decades, academic institutions began to adopt more structured DEI initiatives, influenced by legal mandates and the evolving scholarly understanding of diversity and inclusion. Researchers and educators have extensively studied the impacts of diverse learning environments, highlighting benefits such as enhanced critical thinking, greater cultural competence, and improved academic outcomes for all students. These findings have provided a robust evidence base for implementing DEI strategies across campuses. Institutional reform efforts have also played a pivotal role in advancing DEI. Universities and colleges have established dedicated offices and positions focused on diversity, equity, and inclusion, developed comprehensive DEI plans, and implemented targeted programs to support underrepresented students, faculty, and staff. These efforts are complemented by adopting inclusive curricula that reflect diverse perspectives and promoting equitable hiring and promotion practices to ensure representation at all levels of the academic hierarchy.

The paper lays the groundwork for applying system design methodology to DEI in higher education. Its main aim is to present a conceptual argument rather than empirical research findings. This distinction is important because the paper paves the way for future empirical work instead of presenting research results at this stage. In the next section, we present a categorization based on our experience and review of the work done in DEI.

II. RESEARCH WORK IN DEI

Despite the progress made, challenges still need to be addressed to realize the goals of DEI in higher education fully. Resistance to change, socio-economic disparities, and evolving legal challenges pose significant obstacles. Nevertheless, the ongoing commitment to DEI is evident in the continuous development of innovative policies and practices to foster inclusive and equitable academic environments. Therefore, we see that the topic continues to generate considerable attention and analysis from scholars across various disciplines. This extensive body of research has effectively segmented DEI into several critical areas, each addressing distinct aspects of how diversity, equity, and inclusion can be implemented and improved within organizations and societies. Before presenting our categorization of the DEI works, we would start by covering a few published research works. In [8], the authors use a data-driven approach to explore how considerations of race in

admissions have affected not only the students themselves but also the institutions they attend and society at large. The book draws on a wealth of data collected from a large number of colleges and universities to assess the educational, employment, and societal outcomes of affirmative action beneficiaries. [9] represents a survey conducted by the Pew Research Center on DEI in the workplace, revealing that most U.S. workers see the focus on DEI as positive. However, opinions vary across demographic and political lines. In [10], the authors presented the challenges of DEI leadership, highlighting the importance of embedding DEI principles into core employee and management processes. [11] proposes six strategies to enhance DEI within scholarly publishing, addressing the roles of editors, reviewers, and academic institutions in fostering an inclusive and unbiased academic environment. [12] examines DEI issues in consumer research, focusing on diversity in market spaces and organizations and the importance of equity and inclusion for procedural and distributive justice. [12] presents a comprehensive survey of DEI literature in academia, analyzing academic research and articles from media and think tanks, highlighting the need for diversity and inclusion in educational spaces. [14] provide evidence-based expert responses to politicized misinformation about DEI to support the value of DEI initiatives on college campuses. [15] highlights the biases embedded in technology due to the views and experiences of designers, leading to harm for marginalized populations. Through interviews with professionals, it explores how DEI principles can be integrated into engineering education, specifically in systems engineering. [16] establishes explicit connections between ethics and DEI in engineering education and related fields. [17] explores the impact of faculty understanding and preparation in discussing DEI on students' comprehension of these topics and their ability to foster inclusive teaming cultures. [18] provides a study that suggests institutions should develop faculty that have a more complete understanding of gender inequity and the underlying bias they may have so they can adequately promote gender equity in their classrooms. [19] provides a study of critical discourse in engineering syllabi, indicating that syllabi that engaged inclusive design practices significantly impacted women's feelings of belonging in their courses. [20] presents a study that suggests implementing an inclusive model in the classroom improves the student's cultural competence. [21] presents results that suggest that instructors can shape norms that support academic success, belonging, and the formation of teams with inclusive behaviors through how they approach DEI conversations. [22] explores engineering faculty's readiness to address DEI, revealing a gap in action despite awareness, and introduces the Problemization-to-Action Continuum model to assess faculty's engagement with DEI efforts. [23] discusses challenges in creating inclusive learning environments amid DEI backlash, focusing on underrepresented groups in engineering and computing, and offers strategies to navigate these issues within educational settings.

III. OUR GOAL AND APPROACH

This work aims to justify applying a system design approach to DEI in higher education. Applying a system design approach to DEI in higher education is valid and essential for creating sustainable and impactful changes. This methodology aligns

with established organizational change management principles, data-driven decision-making, and stakeholder engagement, ensuring that DEI initiatives are comprehensive, inclusive, and effective. Research and institutional case studies demonstrate that holistic DEI strategies significantly improve campus climate, representation, and academic outcomes. By integrating DEI as an integral component of the academic ecosystem, institutions can foster environments that promote long-term equity and inclusivity.

We have categorized the published studies using reviewed references and similar works based on our experience and knowledge. We have outlined eight general areas, followed by the sub-areas that we have identified. Identifying these sub-areas is akin to identifying independent variables that influence functions in engineering systems design. In engineering systems design, we identify objectives and the variables affecting functions, distinguishing between dependent and independent variables, and then strive to achieve our goals within given constraints and requirements. The categories identified in the next section serve as general objectives or requirements. The subsequent breakdowns can be considered as variables. This structured approach helps systematically address and analyze the complexities of DEI initiatives, ensuring that all relevant factors are considered to achieve comprehensive and effective outcomes.

IV. GENERAL CATEGORIES UNDER DEI

(i) *Inclusive teaching and learning*: Research on inclusive teaching and learning practices in higher education, including approaches to course design, pedagogy, and assessment that promote equity and inclusion and support diverse student populations.

(ii) *Faculty and staff diversity*: These publications focus on the diversity of faculty and staff in higher education, as well as the policies and practices that institutions adopt to promote diversity in these areas. Examples of topics covered in these publications include the recruitment and retention of underrepresented faculty and staff, the impact of diversity on teaching and research, and the creation of inclusive workplace environments.

(iii) *Student experiences and outcomes*: These publications examine the experiences and outcomes of students from underrepresented groups in higher education, including racial/ethnic minorities, first-generation students, and students from low-income backgrounds. Examples of topics covered in these publications include retention and graduation rates, campus climate and sense of belonging, and the impact of diversity on academic outcomes.

(iv) *Institutional policies and practices*: These publications focus on the policies and practices that higher education institutions adopt to promote diversity, equity, and inclusion. Examples of topics covered in these publications include affirmative action, diversity training, bias reporting mechanisms, and creating inclusive campus environments.

(v) *Intersectionality and social justice*: These publications explore the intersectionality of various forms of identity, such as race, gender, sexual orientation, and disability, and how these

intersections impact experiences in higher education. They also explore the role of higher education in promoting social justice, equity, and inclusion in broader society.

(vi) *Innovative and emerging topics*: These publications focus on the role of technology, globalization, and community partnerships in fostering diversity, equity, and inclusion.

(vii) *Global perspectives*: These publications examine diversity, equity, and inclusion in higher education from a global perspective, including the experiences of international students and the impact of globalization on the diversity of the student body and faculty. They also explore the role of higher education in promoting global citizenship and cross-cultural understanding.

(viii) *Policy and advocacy*: These publications are focused on providing recommendations for advancing DEI in higher education at the institutional, state, and national levels, including discussions of funding, accountability, and collaboration.

As previously mentioned, these categories are incomplete; many DEI publications may fit into multiple categories or transcend them. Nonetheless, they offer a general framework for understanding the diverse issues and approaches pertinent to DEI in higher education. Next, we will present additional breakdowns associated with one or more of these general areas.

V. VARIABLES RELATED TO THE GENERAL CATEGORIES

In understanding DEI initiatives within higher education, it is important to recognize that the categories provided serve as a flexible framework rather than rigid classifications. Many DEI publications address multiple facets of diversity, equity, and inclusion, reflecting the interconnected nature of these issues. By presenting additional breakdowns, we aim to elucidate further the specific variables and sub-areas that impact DEI efforts, offering a comprehensive overview that facilitates targeted and effective strategies.

1. Diversity and representation
2. Equity and Access
3. Inclusive teaching and learning
4. Institutional change and policies
5. Intersectionality and identity
6. Student experiences and outcomes
7. Faculty and staff diversity
8. Intersectionality, social justice, and power dynamics
9. Global perspectives
10. Research and data analysis
11. Best practices, case studies, and innovative approaches
12. Perspectives and voices from stakeholders
13. Evaluation and impact assessment
14. Recruitment, retention, and inclusive practices
15. Inclusive pedagogy and classroom climate
16. International and comparative perspectives

By incorporating these specific characteristics of Diversity, Equity, and Inclusion into each subcategory of the university system, institutions can create a more comprehensive and effective approach to fostering diversity, equity, and inclusion across the entire campus community.

VI. SYSTEM DESIGN FRAMEWORK FOR DEI

In engineering design methodology, several requirements and principles closely align with Diversity, Equity, and Inclusion goals. By examining these requirements and principles, we can uncover significant parallels reinforcing the importance of integrating DEI into academic and organizational systems. Let us explore some of these requirements and how they resemble DEI principles, highlighting how they can be applied to promote a more inclusive and equitable environment.

User-Centered Design:

Engineering Principle: User-centered design focuses on understanding and addressing the needs, preferences, and experiences of end users to create functional and user-friendly products and systems.

DEI Resemblance: Similarly, DEI initiatives prioritize understanding and addressing the diverse needs of all academic or organizational community members. This involves creating policies, programs, and environments that are inclusive and accessible to individuals from varied backgrounds and experiences. Just as user-centered design seeks to enhance user satisfaction and usability, DEI aims to foster a sense of belonging and equitable opportunities for all.

Ethical Considerations:

Engineering Principle: Ethical considerations in engineering design encompass fairness, safety, and social responsibility. Engineers are expected to design products and systems that are safe, reliable, and beneficial to society.

DEI Resemblance: DEI principles similarly emphasize fairness, equity, and social justice. This involves ensuring that policies and practices do not discriminate against any group and actively work to eliminate systemic inequalities. In both contexts, ethical considerations drive the commitment to creating environments and systems that are just and equitable.

Accessibility Standards:

Engineering Principle: Accessibility standards in engineering ensure that products and systems are usable by individuals with diverse abilities, including those with disabilities. This involves designing features that accommodate a wide range of physical, sensory, and cognitive capabilities.

DEI Resemblance: DEI initiatives similarly focus on creating inclusive environments that are accessible to all individuals, regardless of their abilities. This includes implementing accessible facilities, resources, and technologies that support the participation and success of individuals with disabilities. Both contexts emphasize the importance of removing barriers to access and participation.

Cultural Sensitivity:

Engineering Principle: Cultural sensitivity in engineering design involves recognizing and respecting diverse cultural norms, values, and practices. This ensures that products and systems are relevant and acceptable to diverse user groups.

DEI Resemblance: DEI principles also emphasize cultural competence and inclusivity, promoting awareness and respect

for diverse cultural backgrounds within an organization. This involves creating programs and practices that reflect and honor the community's cultural diversity, fostering an inclusive atmosphere that values all perspectives.

Equitable Distribution of Benefits:

Engineering Principle: Equitable distribution of benefits in engineering ensures that the positive impacts of technology and systems are shared fairly among all users without disproportionately benefiting or disadvantaging any group.

DEI Resemblance: DEI initiatives strive for equitable access to opportunities and resources within an organization, ensuring that all individuals can succeed and benefit from institutional support. This involves addressing disparities and implementing policies that promote fairness and equity for all community members.

Participatory Design Processes:

Engineering Principle: Participatory design involves engaging diverse stakeholders in the design process, ensuring their voices and perspectives are considered in decision-making. This collaborative approach leads to more effective and inclusive outcomes.

DEI Resemblance: DEI initiatives similarly value the input and engagement of diverse stakeholders, including students, faculty, staff, and community members. This collaborative approach ensures that DEI strategies are informed by the experiences and needs of those they are intended to benefit, leading to more inclusive and effective policies and programs.

Organizations can create more inclusive, equitable, and effective environments by integrating these engineering design principles into DEI strategies. Next, we will describe the systems design framework as it applies to DEI. This approach not only aligns with best practices in engineering but also reinforces the commitment to promoting diversity, equity, and inclusion within academic and organizational systems.

1. System Identification:

Stakeholders: Identify key stakeholders, including students, faculty, staff, administration, alums, and the broader community. Understand their roles, needs, and interactions within the system.

Components: Map out the critical components of the academic system, such as admissions, curriculum, hiring practices, campus climate, support services, and community engagement.

2. Requirements Analysis:

Data Collection: Gather quantitative and qualitative data on current DEI status, including demographic information, survey results on campus climate, retention and graduation rates of underrepresented groups, and hiring and promotion statistics.

Needs Assessment: Conduct needs assessments to identify gaps and areas for improvement. Engage stakeholders through focus groups, interviews, and surveys to ensure diverse voices are heard and considered.

3. System Modeling:

Visual Representation: Develop visual models such as flowcharts, system maps, and causal loop diagrams to illustrate how different components and stakeholders interact and impact DEI outcomes.

Scenario Analysis: Use modeling to explore different scenarios and predict the impact of various DEI initiatives. This helps in understanding potential outcomes and identifying the most effective strategies.

4. Solution Design:

Inclusive Policies: Design policies that promote equity and inclusion, such as equitable hiring practices, inclusive curriculum requirements, and support for underrepresented students.

Programs and Initiatives: Develop targeted programs to address identified gaps, such as mentorship programs for minority students, DEI training for faculty and staff, and affinity groups that provide community and support.

Resource Allocation: Ensure that resources are allocated equitably to support DEI initiatives. This includes financial resources, staffing, and access to facilities and services.

5. Implementation Planning:

Action Plan: Create a detailed action plan outlining specific steps, timelines, responsibilities, and resources needed for implementation. Ensure the plan includes short-term and long-term goals.

Pilot Programs: Implement pilot programs to test new DEI initiatives on a smaller scale before wider rollout. Gather feedback and make necessary adjustments.

6. Monitoring and Evaluation:

Performance Metrics: Establish clear performance metrics to evaluate the success of DEI initiatives. Metrics might include diversity in student and faculty populations, retention and graduation rates, survey results on campus climate, and the effectiveness of support services.

Continuous Improvement: Implement a feedback loop to assess and improve DEI efforts continuously. Regularly collect data, analyze results, and adjust strategies as needed.

7. Risk Management:

Identify Risks: Identify potential risks and challenges to DEI initiatives, such as resistance to change, funding constraints, or unintended consequences.

Mitigation Strategies: Develop strategies to mitigate identified risks. This may include communication plans to build support, contingency plans for funding shortfalls, and measures to ensure accountability.

VII. EXAMPLES OF DEI METRICS AND PRACTICES

1. Producibility:

Accessibility Metrics: Measure the accessibility of course materials, support services, and campus facilities. Ensure that all students, regardless of disability, have equitable access to resources.

Representation Metrics: Track the representation of diverse groups in academic programs, leadership positions, and student organizations.

2. Sustainability:

Longevity Metrics: Assess the sustainability of DEI initiatives by tracking long-term outcomes such as retention rates, graduation rates, and career success of underrepresented students.

Inclusivity Metrics: Monitor the inclusivity of campus culture through surveys on belonging, respect, and inclusivity among students and staff.

3. Affordability:

Economic Accessibility Metrics: Measure the effectiveness of financial aid programs, scholarships, and other support mechanisms in making education affordable for all students.

Equity in Resource Allocation: Track how resources are distributed across different departments and programs to ensure equitable support for DEI initiatives.

VIII. REMARKS AND CONCLUSION

Adopting a system design approach to Diversity, Equity, and Inclusion in higher education is both valid and essential for fostering sustainable and impactful change. By integrating organizational change management principles, data-driven decision-making, and stakeholder engagement, institutions can create comprehensive, inclusive, and effective DEI initiatives.

Applying life-cycle methodologies from engineering design to DEI initiatives further strengthens these efforts. By focusing on accessibility, cultural sensitivity, ethical considerations, and participatory processes, institutions can ensure that their DEI strategies are not only effective but also equitable and inclusive. The parallels between engineering design principles and DEI goals underscore the importance of a systematic, integrated approach to achieving long-term equity and inclusivity within academic environments.

While the paper does not present original research data, it makes a significant contribution by establishing parallels between established engineering design methodologies and DEI principles. The argument for a systems design approach as 'valid and essential' is grounded in logical reasoning and systematic comparison of these methodologies with DEI concepts. This work not only provides a theoretical foundation but also paves the way for future empirical studies to test these assertions.

Building on established research and successful case studies, the presented framework offers a solid theoretical basis for applying a system design perspective to DEI in higher education. It emphasizes the integration of DEI into institutional systems, laying the groundwork for empirical validation. This approach aims to enhance DEI outcomes and strengthen the institution's overall health, fostering environments where all community members can thrive.

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