Race to R1: An Analysis of Historically Black Colleges or Universities (HBCUs) Potential to Reach Research 1 Carnegie Classification® (R1) Status

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Race to R1: An Analysis of Historically Black Colleges or Universities (HBCUs) Potential to Reach Research 1 (R1) *Carnegie Classification*® Status

Abstract

Since 1973, the Carnegie Classification® has been the guiding framework for determining which U.S.-based higher education institutions are considered the top in the country. The complex and multi-layered calculation gives institutions the designation of labeled research one (R1) or research two (R2) institutions, requiring institutions to grant doctoral degrees. These designations are pivotal in determining which institutions obtain high-quality resources through ongoing decisions by many organizations, including federal agencies, private sector organizations, and philanthropists. Additionally, the designations are instrumental in crucial policy decisions that have the future, mobility, and overall sustainability of operations within institutions, including its various stakeholders (i.e., faculty, staff, and students) at its core. As of 2023, while none of the nation's 101 historically black colleges and universities (HBCUs) have received the highest designation of R1 status, 11 hold the status of R2. Notably, over the past decade, several of those 11 institutions have made obtaining R1 status a top priority for their organization, with many embedding the goal in their critical strategic plans or key initiatives within their leadership teams' organizational priorities. Despite such efforts, an integral ingredient to achieving R1 status – leadership – is under-researched in the field. Thus, our study aims to acknowledge the vital role of transformational and distributed leadership within HBCUs and their broader stakeholder community in achieving their goal of reaching R1 status.

The goal of this research study is to (1) conduct an analysis of data available within the Carnegie Classification®, (2) provide a thorough review of the literature surrounding this phenomenon, (3) explain the role of engineering-related expenditures and engineering education within this phenomenon, (4) ascertain the capabilities of the institutional leadership and motivations towards R1 status, and (5) use that information, all inclusively, to determine who will be the first of the eleven R2 and three R3 HBCUs to receive the R1 designation. Thus, the research questions guiding this study are: (1) *Which historically black college and/or university (HBCU) is most likely to obtain Carnegie Classification® R1: doctoral universities – very high research activity status first?* (2) *RQ #2: How do engineering-related expenditures and education impact or influence HBCUs' Research 1 status potential?* Results explain which of the 14 R2 and R2 HBCUs will be the first and most likely to obtain the designation for the upcoming results and why. Implications for this research study and its results, recommendations for future research, and a concluding statement are provided.

HBCUs and Carnegie Classification® Status

In recent years, mainstream media has increased its conversations around the 11 HBCUs with R2 status. Blavity, a famous Black tech innovation and industry-based organization, published an article in 2022 highlighting the 11 HBCUs that achieved or maintained the coveted R2 status in the 2021 Carnegie classification update (Fenley, 2022). Additionally, Sherrell Dorsey, a highly recognized blogger and *Top Voice* for LinkedIn, listed efforts to attain R1 status as the top trend to look out for about HBCUs in 2023 (Dorsey, 2023). In her *Top Insights piece*, Donastorg (2022) recognizes the HBCU race to R1 status as one of the most significant efforts too few in the academic and non-academic space are discussing. Donastorg provides information about the efforts being made, including the HBCU Research, Innovation, Security, and Excellence (RISE) Act introduced in the Spring of 2011 by Maryland U.S. Senator Chris Van Hollen and North

Carolina Republican Senator Thom Tillis. This act is a bipartisan policy directly focused on assisting HBCUs with R2 status to achieve R1 status through the development and execution of a pilot program with the U.S. Department of Defense (Donastorg, 2022). In addition, *the Feed* published an online piece titled "HBCUs seek highest recognition for research and innovation" (Georgetown University, 2022), which examined how HBCUs are meeting key required areas of the classification system (e.g., research spending and doctoral degrees awarded), yet have still not received the R1 status. Important to note, Carnegie Classification® appears to be restricting their system to account for equity and student success, particularly student retention, per Mushtaq Gunja, executive director of the organization and senior vice president of the American Council on Education (Georgetown University, 2022). As such, when considering these current and potential changes alongside the recent Supreme Court decision to end race-conscious admissions, many HBCUs are seeing a surge in applications and admissions, which could also impact their institution's goal of reaching R1 status (Ford, 2023; Weissman, 2023).

The Carnegie Classification® is the leading framework for recognizing and describing institutional diversity in U.S. higher education. The Carnegie Commission on Higher Education developed the system in 1973 to support its research and policy analysis program. Derived from empirical data on colleges and universities, the Carnegie Classification® was updated in 1976, 1987, 1994, 2000, 2005, 2010, 2015, 2018, and 2021 to reflect changes among colleges and universities. The system includes any institution of higher education that conferred at least one degree during 2019-20, as reported through the National Center for Education Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS). The Classifications also includes data from military service institutions that do not currently participate in the IPEDS survey.

Further information on the criteria for inclusion is available in the IPEDS methodology. There are a total of 6 classifications: (1) Basic, (2) Undergraduate Instructional Program, (3) Graduate Instructional Program Classification, (4) Enrollment Profile Classification, (5) Undergraduate Profile Classification, and (6) Size and Setting Classification. The framework is used in the study of higher education and is intended to be an objective, degree-based lens through which researchers can group and study similar institutions. Carnegie Classifications are used in research study design to ensure adequate representation of sampled institutions, students, or faculty, among other uses.

For doctoral university designations, there are three categories: R1: Doctoral Universities – Very high research activity, (2) R2: Doctoral Universities – High research activity, and (3) D/PU: Doctoral/Professional Universities. As of 2018, the institution classification system was changed to R1 or R2 if they had successfully conferred a minimum of 20 research and/or scholarship doctorates as of 2016-17. Additionally, the institutions would have a minimum of $5 million in research expenditures. Based on this information, the institution would be given a *research activity index,* a calculation that was inclusive of the following metrics:

1) Research & development (R&D) expenditures in science and engineering (S&E)
2) R&D expenditures in non-science and engineering fields
3) Science and engineering research staff (postdoctoral appointees and other non-faculty research staff with doctorates)
4) Doctoral degrees conferred in humanities, social science, STEM (science, technology, engineering, and mathematics) fields as well as other non-STEM fields

Considering this data, each institution was given a principal component analysis to create two indices of research activity, one representing an aggregate level and the other representing per-capita research activity. Organizations with high metrics for both indices were designated as R1: Doctoral Universities with very high research activity. At the time of this study, 146 institutions are classified as R1 institutions. These universities have a very high level of both research activity and per capita in such research activity, using a comprehensive collection of data to determine both measurements. In other words, these institutions provide an extensive number of resources for research and have a large quantity of human resources allocated toward conducting research at their respective higher education institutions.

Literature Review

The Path to Research 1 (R1) Status and Why It Matters for HBCUs

As of 2021, 133 institutions have been classified as "R2: Doctoral Universities – High research activity". It has been determined that each of these higher education institutions has a very high level of (1) research activity or per capita in such research activity, using aggregate data to determine both measurements while having a shallow level on the other qualification. Of the 101 HBCUs included within the *Carnegie Classification*® public data file*,* 11 have received *R2: Doctoral Universities: High Research Activity* status, and three have received *R3: Doctoral/Professional Universities* status. HBCUs with R3 status are included because it is important to note that designations can and will change based on your index each time new rankings are released. In this case, there have been HBCUs formally R2 statuses but are now R3 status as of the 2021 classification. Table 1 below highlights those institutions.

Table 1: List of HBCUs with *R2: Doctoral Universities – High research activity* and *R3: Doctoral/Professional Universities Carnegie Classification*®

#	HBCU	City	State	Carnegie Classification®
1	Alabama State University	Montgomery	AL	R3
2	Clark Atlanta University	Atlanta	GA	R2
3	Florida Agricultural and Mechanical University	Tallahassee	FL	R2
4	Hampton University	Hampton	VA	R3
5	Howard University	Washington	DC	R2
6	Jackson State University	Jackson	MS	R2
7	Morgan State University	Baltimore	MD	R2
8	North Carolina A&T State University	Greensboro	NC	R2
9	Prairie View A & M University	Prairie View	TX	R2
10	Southern University and A & M College	Baton Rouge	LA	R2
11	Tennessee State University	Nashville	TN	R2
12	Texas Southern University	Houston	TX	R2
13	University of Maryland Eastern Shore	Princess Anne	MD	R2
14	Winston-Salem State University	Winston-Salem	NC	R3

SOURCE: Carnegie Classification of Institutions of Higher Education (2024)

One of the critical differences between receiving R1 status versus R2 status is the essential resources that institutions lack access to. For example, many R2 institutions score low in areas of research facilities or have fewer individuals applying for and/or obtaining national competitive funding via federal grants, for example, due to a lack of capacity to apply for such resources. These two classifications can be seen as the aggregate supply and demand for research, respectively. This note is significant given the well-documented argument that certain minority-serving institutions, particularly HBCUs, have continued to struggle with a lack of funding and resources received from their local, state, and federal governments (National Academies of Sciences, Engineering, and Medicine, 2019; Fletcher et al., 2019). As Vice President of Research and Economic Development at Morgan State University, Dr. Willie E. May stated, "R-1 is the gold standard for quality educational research". He went on to state that the [university] could "…better support the community, the region, our state, our nation, and the world by having this merit badge." (Weissman, 2022).

For HBCUs, the institutions could benefit in similar ways to predominately white institutions (PWIs) who have benefitted greatly from their current Research 1 status, including high-quality faculty, an increased number of research faculty, post-doctoral researchers, administrators, and staff who can support research efforts and more staff to support the growing number of students that would choose to attend those institutions (McCormick & Zhoa, 2005; Shulman, 2001).

Theoretical Framing

When considering what is required to transition from R2 or R3 status to R1 status, the role of leadership within the institution is critical to the conversation and often overlooked. For the areas that are included within the R1 index: research & development (R&D) expenditures in science and engineering, research and development expenditures, science and engineering research staff (postdoctoral researchers, etc.), and doctoral degrees conferred across all fields, each of these areas requires decisions to be made from the most senior individuals at the institution (i.e., leaderships, president, chancellors, and executive cabinet members). In some cases, this can also include members of the board of trustees and community stakeholders (e.g., alumni, policymakers, etc.).

The theoretical framing through which this study centers, transformational distributed leadership theory, combines the principles of transformational leadership with the concept of distributed leadership. Transformational leadership, as conceptualized by Bass (1985), emphasizes the ability of leaders to inspire and motivate followers to achieve unexpected or remarkable results by transcending their self-interests for the sake of the organization or a higher cause. This form of leadership is characterized by four key components: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Distributed leadership, as detailed by Spillane, Halverson, and Diamond (2004), posits that leadership functions are spread among different individuals within an organization rather than being centralized in a single leader. This approach to leadership highlights the collaborative and emergent aspects of leadership practice within the complex social systems of organizations (Harris, 2008). This theory posits that the synergy between transformational leadership practices and a distributed leadership structure can lead to higher organizational effectiveness and adaptability levels by leveraging its members' diverse talents and perspectives (Spillane, Halverson, & Diamond, 2004). Integrating transformational and distributed leadership within the higher education sector

presents a compelling paradigm for fostering an environment conducive to innovation, change management, and institutional growth – all of which fare well to the goal of reaching R1 status.

Applying the principles of transformational distributed leadership theory to Historically Black Colleges and Universities (HBCUs) with R2 status who are striving to obtain R1 status reveals its potential to impact academic research and funding growth significantly. Research 2 HBCUs, characterized by high research activity but not at the level of Research 1 institutions, face unique challenges and opportunities in expanding their research capabilities and securing funding. According to Gasman and Commodore (2014), transformational leadership within HBCUs can inspire a culture of research excellence and innovation, while the distributed aspect of leadership ensures that a broader spectrum of the university community is engaged in research activities and initiatives. This collaborative approach can enhance the institution's ability to attract funding by showcasing a unified, strategic commitment to research. Furthermore, fostering an environment where leadership is shared, and all members are motivated to contribute to the institution's research agenda can lead to increased grant submissions, interdisciplinary research projects, and partnerships with external stakeholders, ultimately driving growth in research activity and funding (Commodore, Freeman, Gasman, & Carter, 2016).

Integrating transformational and distributed leadership practices at HBCUs also has the potential to strengthen partnerships with industry, government, and non-profit organizations. These collaborations can provide additional resources, expertise, and opportunities for applied research, further boosting the institutions' research capabilities and funding prospects. A leadership approach that is both inspirational and participatory can facilitate the negotiation of these partnerships, ensuring that they align with the institution's strategic objectives and contribute to its growth and sustainability.

As such, transformational distributed leadership theory offers a compelling framework for enhancing organizational effectiveness and fostering innovation in higher education, particularly within HBCU R2 and R3 institutions. By integrating transformational leadership's motivational and visionary aspects with distributed leadership's inclusive and collaborative nature, HBCUs can strengthen their research capabilities and funding prospects. As these institutions navigate the challenges of increasing research activity and securing financial resources, adopting a transformational distributed leadership approach can be critical in achieving their goals and advancing their mission.

Research Methodology

Based on the information shared, our primary research question driving this study is: *Which historically black college and/or university (HBCU) is most likely to obtain Carnegie Classification® R1: doctoral universities – very high research activity status first?* When taking into consideration the influential role of science and engineering in the context of calculating the index figure that determines R1 status and given the target audience for ASEE, engineering education, our team added the following essential research question to this study: *In what ways do engineering-related expenditures and education impact or influence HBCUs' Research 1 status potential?* Moreover, the approach to answering the research questions was directly in line with how Carnegie Classification® determined their ratings. Thus, the data used to assess their designations was pulled and analyzed from varying national data sources and data provided at

the institutional offices. Four years for national datasets were included in this study so that changes over time could be captured.

Results and Discussion

For *RQ #1: Which historically black college and/or university (HBCU) will obtain Carnegie Classification® R1: doctoral universities – very high research activity status first?* Although various factors determine the rankings, key differentiating factors exist for how an institution transition from R2 to R1 status. As such, there are two critical differences between R1 and R2 institutions, and this study takes a closer look at existing data to answer our first research question. They include (1) enrolling and graduating more doctoral students and (2) significantly increasing funding opportunities. Thus, Table 2 below highlights the number of graduate degrees, both master's and doctoral-level degrees, conferred from the 14 HBCUs with R2 or R3 status.

Table 2: Number of Graduate Degrees Conferred by R2 HBCUs (Masters and Doctorates Degrees Combined)

#	Institution	2017-18	2018-19	2019-2020	2020-2021
1	Howard University	815	776	717	796
2	Florida Agricultural and Mechanical University	643	630	616	607
3	North Carolina A&T State University	480	469	453	434
4	Tennessee State University	448	411	448	391
5	Morgan State University	322	319	363	335
6	Prairie View A & M University	406	406	361	300
7	Jackson State University	449	505	451	491
8	Hampton University	241	237	192	206
9	Texas Southern University	672	615	563	489
10	Clark Atlanta University	263	208	186	187
11	University of Maryland Eastern Shore	152	168	148	125
12	Winston-Salem State University	139	150	182	175
13	Southern University and A & M College	311	281	239	461
14	Alabama State University	176	114	150	141

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS)
Fall enrollment, degrees conferred, and expenditures in degree-granting historically Black colleges and universities by institution (Tables 313.10 for years 2017-18, 2018-19, 2019-20, and 2020-21)

Additionally, when analyzing the 2022 report on the Survey of Earned Doctorates, results showed that four of the 11 R2 HBCUs are in the Top 20 for producing the most African American and Black students earning doctorate degrees. An important note is that this included degrees conferred across all fields, data included in the Carnegie Classification® index. Table 3 highlights those four HBCUs (in bold) and the non-HBCUs that made the Top 20 list.

Table 3: Top 20 Producers of Doctorate Degrees to African Americans and Blacks in the U.S.

Institution	Rank	Doctorate recipients
Black or African American (392 institutions)	-	12,523
From top 20 institutions	-	4,135
Walden U.	1	1,567
Howard U.	**2**	**247**
Jackson State U.	**3**	**215**
U. Georgia	4	159
Georgia State U.	5	145
U. Florida	5	145
U. Michigan, Ann Arbor	7	141
Louisiana State U., Baton Rouge	8	136
Ohio State U., Columbus	9	130
U. North Carolina, Chapel Hill	10	128
Morgan State U.	**11**	**124**
U. Maryland, College Park	11	124
Michigan State U.	13	118
North Carolina Agricultural and Technical State U.	**14**	**112**
U. Illinois, Urbana-Champaign	14	112
Florida State U.	16	109
George Washington U.	16	109
Harvard U.	18	105
U. Memphis	18	105
Columbia U. in the City of New York	20	104

Source: Table 7-4 of the 2022 Report on Survey of Earned Doctorates: https://ncses.nsf.gov/pubs/nsf24300/data-tables

Similar in significance to increasing the number of graduate degrees conferred, HBCUs aiming to achieve R1 or R2 status must also aim to improve their research funding. As such, Table 4 below highlights the annual research and development expenditures between fiscal years 2018 through 2021 for the 14 HBCUs with R2 or R3 status (Table 1). These figures include a total amount encompassing science and engineering and non-science and engineering dollars.

Table 4: HBCU Higher Education R&D expenditures ranked by FY 2021 R&D expenditures (dollars in thousands)

#	Institution	2018	2019	2020	2021	R&D Expenditure Ranking (2021) (out of 648)*
1	Howard University	45,965	44,163	44,933	52,412	197
2	Florida Agricultural and Mechanical University	39,682	42,470	41,319	47,124	211
3	North Carolina A & T State University	38,140	37,339	36,151	40,751	225
4	Tennessee State University	17, 681	15,236	15,377	26,880	247
5	Morgan State University	12,993	13,253	17,193	20,628	276
6	Prairie View A & M University	17,278	18,018	18,723	17,582	292
7	Jackson State University	19,465	18,160	15,081	16,157	301
8	Hampton University	14,424	13,605	11,402	11,669	332
9	Texas Southern University	3,740	4,893	4,782	9,128	348
10	Clark Atlanta University	3,733	9,048	8,452	8,892	352
11	University of Maryland Eastern Shore	4,941	7,133	8,092	8,636	357
12	Winston-Salem State University	1,629	2.011	5,781	8,123	361
13	Southern University and A & M College	4,171	5,448	4,475	6,164	391
14	Alabama State University	2,434	2,577	2,582	2,631	498

Note: Dollars explained – For Howard University (2021) - $52,412,000 in R&D expenditures that fiscal year (FY)
National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.
Retrieved from: https://ncses.nsf.gov/surveys/higher-education-research-development/2021#data (Table 21)
*R&D Expenditure Ranking (2021) explains where the institution ranked amongst all higher education institutions in the U.S. that year (Out of 648)

RQ #2: In what ways do engineering-related expenditures and education impact or influence HBCUs' Research 1 status potential?

The data provided in Table 4 above is critical as science and engineering-related funding are traditionally the highest-funded areas in the form of grants received by higher education institutions with research R1 status. In other words, if HBCUs want to receive R1 status, they will achieve it sooner by focusing on receiving STEM-related funding.

From an opportunity standpoint, an emerging and fast-growing area of study, engineering and computing education, aids in improving the pedagogical and epistemological outcomes of engineering (and other broader STEM fields) within higher learning institutions (Carberry & Baker, 2019). As such, engineering and computing education can support science and engineering academics interested in applying for additional funding to help their students and advance their contributions to scholarly fields. Interestingly, approximately 47 U.S.-based Doctoral Universities have engineering education or similar departments (Carberry, 2024). On average, approximately 2,000 colleges and universities have received funding from the National Science Foundation, with 8.5 billion going directly toward engineering, computing, and STEM education efforts (National Science Foundation Fact Sheet, n.d.). These funds have broadened participation in science and engineering at undergraduate and graduate levels and have strengthened the science and engineering research and development expenditures, ranging from students receiving scholarships and fellowships towards their degree completion to students conducting summer research on-campus during the year or summer with faculty (Commodore et al., 2016; Hendrickson & Haynes, 2019). As such, other increased expenditures have included awarded grants that consist of cross-institutional collaborations as a part of research funded by organizations such as the Department of Defense (DOD), the Department of Education (DOE), and the National Science Foundations (NSF)'s Engineering Research Centers (ERCs) (Curry et al., 2023; National Academies of Sciences, Engineering, and Medicine, 2019). Several HBCUs have seen their engineering-related expenditures increase due to these collaborative grants, which has also increased the number of graduate students they can fund.

Given the importance of research funding to HBCUs achieving R1 status, it is essential to highlight the success of such institutions in granting degrees in the STEM fields. For example, as it relates to undergraduate engineering education and degree attainment at HBCUs, according to ASEE (2022), six (6) of the top 20 institutions for degrees awarded to African American and Blacks were HBCUs (see Table 5 below). When connecting back to the list of 14 R2 and R3 HBCUs (see Table 1), five (5) of the six (6) listed below have R2 designations.

Table 5: HBCUs within the 2022 Top 20 List of Producers of bachelor's degrees in engineering awarded to African Americans and Blacks

#	College/University	# of Engineering Bachelor's Awarded to African American and Black Students (2022)	*Carnegie Classification®*
1	North Carolina A & T State University	309	R2
6	Prairie View A & M University	122	R2
11	Morgan State University	87	R2
13	Tuskegee University	84	--
16	Southern University and A & M College	74	R2
17	FAMU-FSU College of Engineering	70	R2

American Society of Engineering Education (ASEE) Table 1.1.14 (2022)
Carnegie Classification of Institutions of Higher Education (2024)

Student enrollment and graduation rates at the undergraduate level are critical in determining the dollar amounts provided when considering external funding, including state-based funding, federal funding, and private-sector investing. While the number of undergraduate students doesn't directly impact the index calculation, an institution's ability to recruit and retain students who can conduct year-round undergraduate research for faculty, for example, has broader implications for faculty members' ability to complete their research goals, apply for grants, off-set teaching requirements (typically higher at R2 and R3 teaching-centered institutions) and so much more. Therefore, this table highlights and signifies that data. Important to note; however, data for degrees awarded to African Americans and Blacks by institutions at the master's and doctoral level for engineering were not provided within this ASEE report, only within the category "underrepresented minorities" (American Society of Engineering Education, 2022). Thus, based on the literature and data provided within tables shown previously throughout this study, our team determined that five HBCUs, all of whom currently have R2 status, are the most likely to receive Carnegie Classification® Research 1 status. The following sections highlight relevant information on those four HBCUs, and each of them was included.

#1 Howard University

Howard University, located in the heart of Washington, DC, has seen steady increases in its research and development expenditures over the last four years. As of 2021, Howard University's research and development expenditures have landed slightly above the minimum of R1 Carnegie Doctoral Universities R&D expenditures, $22,612,000. Howard exceeds this minimum with its R&D expenditures totaling over $50 million. Notably, Howard University is part of a larger consortium of HBCUs awarded significant grant funding (90 million dollars) by the Department of Defense's (DOD) Air Force to establish a University Affiliated Research Center (Bailer, 2023). With the increase in funding support, it can be hypothesized that Howard's increasing trend of R&D expenditures will continue. Moreover, Howard University is physically located in an important space, allowing the University to advocate for more resources as it is near significant political activity surrounding higher education. Lastly, when considering our second research question, Howard is among the top 10 producers of undergraduate engineering degree holders, and, according to the 2022 Survey of Earned Doctorates report, Howard ranked #2 in the nation for doctorate degrees earned by African Americans and Blacks (see Table 3). With this information in mind, our analysis finds that Howard University has the

highest potential to reach R1 status for the ranking announcement taking place in 2025. It should be noted that Howard University held the designation from 1987 to 2005 before the classification metrics were changed (Riddick, 2024).

#2 Florida Agricultural and Mechanical University

Florida A&M University (FAMU) has seen an upward trend in R&D expenditure funds from 2018-2021. Compared to the three HBCUs mentioned previously, FAMU comes second to Howard University's 2021 R&D expenditure funds with a little over $40 million. Unlike the other institutions nestled in boisterous urban centers, FAMU it is not located in a geographically advantageous area such as Washington, DC or similar large metropolitan areas with ample access to political advocacy or educational institutions. However, FAMU was amongst the 10 HBCUs that obtained R2 status in 2018, an incredible feat. Like other HBCUs, FAMU has a 2030 strategic plan to expand its research capabilities to obtain R1 status (Skerritt, 2021). They hope to achieve R1 status to obtain more research facilities, get more grant funding, and increase partnerships with industry partners.

#3 North Carolina A&T University

Similar to Howard University, North Carolina A&T located in Greensboro, has also seen an increase in R&D expenditures since 2018. Though they are above the minimum of R1 Doctoral University's R&D expenditures, they fall slightly below Howard's 2021 R&D. For 2021, North Carolina A&T had a little over $40 million in R&D expenditures. Nonetheless, A&T also has a strategic plan called the 'The Preeminence 2030: North Carolina A&T Blueprint in place to propel their university from F2 R2 to R1 status (North Carolina A&T, 2024a; North Carolina A & T, 2024b). This goal aligns with the plan's research expansion initiative, which includes faculty and staff committed to teaching, learning, civic engagement, and service activities surrounding advancing research.

#4 Morgan State University

Morgan State University, nestled in Baltimore, Maryland, did not meet the minimum requirement for R1 Doctoral University's R&D expenditures in 2021. Although their 2021 R&D expenditures were slightly less than the minimum at $20,628,000, they have had an overall increase in R&D expenditures for the last four years. In 2021, Morgan State University's Division of Research and Economic Development created a strategic plan around leadership development to obtain R1 Status (Morgan State University, 2023). Additionally, this plan supports increasing university research outcomes by connecting research area studies related to the economic and social impacts of the university and the greater Baltimore area. Morgan State University is also physically located near Washington, DC, Virginia, and other significant Maryland communities, which positions the University to physically advocate for more educational resources and access to high-quality faculty given the large number of PhD producing Universities nearby.

Considering the data provided within the results for research question #1 and the information found for research question #2, our analysis has determined that Howard University has the highest probability of receiving the Carnegie Classification® Research 1 status upon the release of the new rankings in early 2025 (ACE, 2023). Their overall statistics, including research income and expenditures and the number of graduate-level degrees conferred, were critical

indicators for this decision. Additionally, recent private, public, and federal funds received highlight a trend that should be pivotal in their elevation to Research 1 status.

Overarching Policy Implications

The trajectory of Historically Black Colleges and Universities (HBCUs) toward attaining the Research 1 designation is fraught with policy challenges that could either facilitate or impede their progress. A pivotal obstacle is the distribution of federal and state research funds. Disparities in funding allocation between HBCUs and their Predominantly White Institution (PWI) counterparts present a significant hindrance, directly affecting their research capabilities and ability to attract and retain premier faculty and researchers. Studies have highlighted that these funding disparities are a considerable impediment for HBCUs, as they receive markedly lower amounts of federal research funding than PWIs, which in turn impacts their research capacity and infrastructure development (Gasman & Commodore, 2014; Commodore et al., 2016). This imbalance restricts the range and extent of research endeavors HBCUs can undertake and compromises their capacity to offer competitive research facilities and opportunities along with implications for student and faculty engagement and HBCUs' ongoing success with a sense of belonging with all their stakeholders (Fletcher et al., 2023).

For HBCUs to navigate their path to achieving Research 1 status effectively, it is imperative to contemplate and implement specific policy measures. One vital strategy involves targeted funding policies that can equalize opportunities for HBCUs. Enhancing federal and state research grants designated for HBCUs can significantly improve their research infrastructure, aid in recruiting and retaining outstanding researchers, and facilitate the commencement or amplification of superior research projects. Although the National Science Foundation (NSF) and the National Institutes of Health (NIH) have initiated programs targeting minority-serving institutions, a more unified effort is essential to profoundly influence the research competencies of HBCUs (Espinosa, Turk, Taylor, & Chessman, 2019). Augmented funding prospects would amplify research outputs and fortify the institutions' competitive stance for additional external funding.

Moreover, the accreditation and regulatory frameworks pose additional policy-related challenges that disproportionately impact HBCUs. The rigorous standards set by accrediting agencies for research classifications often necessitate significant institutional resources, advanced research infrastructure, and extensive publication records. Given their history of underfunding and resource limitations, HBCUs might need help to meet these criteria within the set deadlines. Furthermore, regulatory policies concerning research, including compliance and ethics, require considerable administrative and operational investments, exacerbating HBCUs' resource constraints (Conrad & Gasman, 2015). These regulatory hurdles add extra burdens and detract from their focus on fostering research excellence.

Policies promoting partnerships and collaborations between HBCUs, and Research 1 institutions can also provide substantial benefits. Such collaborations enable knowledge sharing, access to state-of-the-art research facilities, and mentorship for young HBCU researchers. Policies incentivizing these partnerships through additional funding or joint grant opportunities could help close the research infrastructure and expertise gap. The NSF's Louis Stokes Alliances for Minority Participation is an exemplary model, promoting alliances that pave pathways to STEM fields for underrepresented students (National Science Foundation, 2020). Encouraging

collaborative research initiatives can further expand HBCUs' research networks and enhance their visibility within the larger research community.

Furthermore, the competitive nature of research funding and collaboration represents another policy dimension that obstructs HBCUs' journey to Research 1 status. The prevailing research funding model is highly competitive, focusing on prior research achievements and existing infrastructure, which places HBCUs at a disadvantage as they strive to enhance their research profiles. Moreover, research collaboration policies favor institutions with established research reputations, creating obstacles for HBCUs in forming advantageous research partnerships (Espinosa et al., 2019). Policy reforms that acknowledge HBCUs' unique contributions to the research ecosystem and provide targeted support to bolster their research capacities are necessary to overcome these challenges.

In conclusion, the advancement and execution of policies aimed at improving research capacity within HBCUs themselves are critical. This includes backing for faculty development programs, research administration, compliance training, and establishing research centers of excellence. Such measures would enable HBCUs to enhance their research administration, grant writing, and management capabilities and foster a culture that values research excellence, thus making them more competitive and poised to achieve Research 1 status (Gasman & Commodore, 2014).

These recommendations underscore the necessity of a comprehensive approach to bolster HBCUs in their quest for research preeminence. By addressing funding inequities, encouraging strategic partnerships, and enhancing internal research capabilities, policymakers can cultivate an ecosystem wherein HBCUs can compete and be positioned to excel as premier research institutions.

Implications for HBCUs

Our study evaluates the necessity of increasing opportunities for HBCUs to speak to broader philanthropic, industry, research and policy communities around decision-making that will elevate HBCUs towards the R1 status goal. The following are three ways in which our study aims to increase the potential of HBCUs to research R1 status:

Funding. Financing is essential to the success of any institution. Though tuition and student fees are a significant portion of incoming funds, funding from other mechanisms, including philanthropic funding, is equally essential and, in some cases, more sustainable. Hence, our study sheds light on the challenges HBCUs face in the funding realm and internal and external recommendations for improving the likelihood of HBCUs increasing their funding mechanisms. In addition to recent studies highlighting the gaps between HBCU and non-HBCU institutions (National Academies of Sciences, Engineering, and Medicine, 2019), our study further acknowledges the need for HBCUs to increase their incoming donations from public and private donors - emphasizing alumni giving - and institutions to establish and solidify more sustaining funding mechanisms.

Research. The first of its kind, our study rings the alarm on the significant need for HBCUs to increase their research goals by allocating additional funding and human capital to acknowledge research as a justifiable and necessary expenditure for the institutions internally and externally. In return, research produced by HBCUs can reach audiences with the most need and elevate

HBCU as a leading voice within the research community. Our study also opens the door for private donors and funders to increase their giving to HBCUs for the elevation of research. Funding can be used to support HBCUs in their efforts to hire experienced researchers to produce top-tier research needed to move the need in communities HBCUs aspire to impact positively. Additional studies are needed on the need for more funding for HBCUs specifically to elevate research. Author Jaret C. Reddick (2024), the same month as the submission of this article for final review, published a piece, *Good News in Progress Toward Top-Tier Research Status for HBCUs?,* which eloquently emphasized the importance of research expenditures. Lastly, our team would like to recommend that reports such as Engineering and Engineering Technology by the Numbers, provided by the American Society of Engineering Education (ASEE), consistent with data be implemented. For example, in their latest report, at the undergraduate level, data for degrees awarded is provided for each ethnic group. For master's degrees and doctoral degrees, however, all historically excluded groups are combined and listed as *underrepresented minorities.* This type of labeling for ethnicity/race does not allow for proper analysis for studies such as ours (American Society of Engineering Education, 2022).

Policy. Our study can increase awareness of the immediate need for policy introduction and implementation to support HBCUs' journey to reaching R1 status. Given the current social climate against racialized individuals, recent Supreme Court decisions, and the geographic location of HBCUs in the nation and within dozens of mostly Southern states, HBCUs are well-positioned to support their surrounding communities. Policy changes supporting their missions and visions for the students, families, and communities they serve are timely and could profoundly impact HBCUs and beyond.

Limitations and Future Work

Our team recognizes a few areas that could expand onto the research questions if further explored as a part of this study or future work. For example, the National Science Foundation (NSF) and the National Institution of Health (NIH) have survey data for graduate students and post-doctoral researchers that were not able to access. This is a crucial data point for the Carnegie Classification calculation. Additionally, the number of non-faculty staff is an essential data point and will play a significant role in calculating HBCUs within the system. Our team recognizes that more research could have been conducted related to research question #2, centered on the role of engineering-related expenditures and engineering education in general, and we plan to conduct that more thorough analysis shortly. This could and will most likely also include the role of science-related expenditures at HBCUs, an area that is heavily influential when considering the goal of research R1 status and a location that HBCUs have been well-documented with a strong presence in and continuously play a positive, influential role from an impact standpoint on a national level. Lastly, it should be noted that the American Council on Education (ACE) and the Carnegie Foundation announced in November 2023 that changes would occur to the process (ACE, 2023). The article stated, "ACE and Carnegie Foundation announces new, more transparent methodology for the current "R1" designation and an overall shift to multi-dimensional categories that reflect the diversity of today's colleges and universities." Based on this, there could be even broader implications for HBCUs on their path to reaching R1 status that we did not cover in this study. Our goal is to cover that in future work, as well.

Conclusion

Our analysis concluded that five historically Black colleges and universities (HBCUs) have the potential to reach Carnegie Classification® Research 1 status in 2025 if their current data trends continue in a positive direction. Based on the results from analyzing national and institutional level data sets and exploring the literature on this phenomenon, we determined that Howard University has the highest chance of being the first HBCU awarded this prestigious designation. Their overall statistics, including research income and expenditures and the number of graduate-level degrees conferred, were critical indicators for this decision. However, leadership and internal and external stakeholders involved in this mission for their institutions must understand the importance of what it will take to achieve this feat and maintain that status. Involving diverse stakeholders in the research planning and execution can lead to more innovative research projects, interdisciplinary collaborations, and comprehensive strategies for securing research funding for these institutions. With great excitement and hope, this research will drive an increased focus on the policy implications associated with this endeavor for HBCUs and that this study will advance and improve the conversations around this significant topic.

References

ACE (2023). American Council on Education. Carnegie Classification to Make Major Changes in How Colleges and Universities Are Grouped and Recognized, Set Clear Threshold for Highest Level of Research. Retrieved from: https://www.acenet.edu/News-Room/Pages/Carnegie-Classifications-to-Make-Major-Changes.aspx

American Society of Engineering Education (ASEE) (2022). *ASEE 2022 Edition: Engineering and Engineering Technology By the Numbers.* Washington, D.C. Retrieved from: https://ira.asee.org/by-the-numbers/

Bailer, B. (2023). "Howard University Awarded $90 Million Contract by Air Force, DOD to Establish First-Ever University Affiliated Research Center Led by an HBCU." The Dig at Howard University, 2023. Retrieved from: https://thedig.howard.edu/all-stories/howard-university-awarded-90-million-contract-air-force-dod-establish-first-ever-university.

Carberry, A. "Engineeringeducationlist [Licensed for Non-Commercial Use Only] / Engineering Education Departments and Programs (Graduate)." engineeringeducationlist.pbworks.com, 2024. http://engineeringeducationlist.pbworks.com/w/page/27610307/Engineering%20Education%20Departments%20and%20Programs%20(Graduate).

Carnegie Classification of Institutions of Higher Education. (2024). Basic Classification. Retrieved from: https://carnegieclassifications.acenet.edu/carnegie-classification/classification-methodology/basic-classification/

Commodore, F., Freeman, S., Gasman, M., & Carter, C. (2016). Historically Black Colleges and Universities: Exploring the role of the chancellor or president in fundraising. Journal of Higher Education Management, 31(2), 1-14.

Conrad, C., & Gasman, M. (2015). *Educating a diverse nation: Lessons from minority-serving institutions*. Harvard University Press.

Curry, M. L., Bonner, C., Stubbs, D., & Payne, N. J. (2023). Advancing Research at the Nation's 101 HBCUs and Their Role in Maintaining the Nation's Competitiveness in Science and Technology. *Accounts of Chemical Research*, *56*(11), 1251-1252.

Donastorg, M. (2022). Analysis: One of the biggest HBCU Efforts Going Unnoticed. *The Plug.* Retrieved from: https://tpinsights.com/analysis-one-of-the-biggest-hbcu-efforts-going-unnoticed%EF%BF%BC/.

Dorsey, S. (2023). HBCU Insights: Three most significant trends to look out for in 2023. *The Plug x HBCU.* Retrieved from: https://www.linkedin.com/pulse/hbcu-insights-three-most-significant-trends-look-out-2023-dorsey/

Fenley, N. (2022). 11 HBCUs Awarded the Coveted R2 Status in the New Carnegie Classification Update. *Blavity.* Retrieved from: https://blavity.com/10-hbcus-awarded-the-coveted-r2-status-in-the-new-carnegie-classification-update?category1=news.

Fletcher, T. L., Jefferson, J. P., Boyd, B., Park, S. E., & Crumpton-Young, L. (2023). Impact of COVID-19 on sense of belonging: Experiences of engineering students, faculty, and staff at Historically Black Colleges and Universities (HBCUs). *Journal of Engineering Education*, *112*(2), 488-520.

Fletcher, T. L., Fletcher, T. L., Williams, J. L., McIntyre, B. B., Boyd, B. N., & Watkins, K. (2019, June). Minority Serving Institutions: America's Underutilized Resource for Strengthening the STEM Workforce Report–Implications for Historically Black Colleges and Universities (HBCUs). In *2019 ASEE Annual Conference & Exposition*.

Ford, B. (2023). HBCU enrollment continues to rise, as colleges face major hurdles. *Atlanta News First.* Retrieved from: https://www.atlantanewsfirst.com/2023/10/06/hbcu-enrollment-continues-rise-colleges-face-major-hurdles/

Gasman, M., & Commodore, F. (2014). The state of research on Historically Black Colleges and Universities. Journal of Multicultural Education, 8(1), 89-104.

Georgetown University. (2022). HBCUs seek highest recognition for research and innovation. *The Feed.* Retrieved from: https://feed.georgetown.edu/access-affordability/hbcus-seek-highest-recognition-for-research-and-innovation/

Harris, A. (2008). Distributed leadership: According to the evidence. Journal of Educational Administration, 46(2), 172-188.

Hendrickson, T. W., & Haynes, J. K. (2019). Successful Strategies for Enhancing Research Capacity among Early-Career HBCU STEM Faculty. *Peer Review*, *21*(1-2), 10-14.

Howard University. "BUILDING on the on the LEGACY," 2017. https://secretary.howard.edu/sites/secretary.howard.edu/files/2021-04/Annual_Report_2017-2018.pdf.

McCormick, A. C., & Zhao, C. M. (2005). Rethinking and reframing the Carnegie classification. *Change: The Magazine of Higher Learning*, *37*(5), 51-57.

Morgan State University. (2024). Carnegie R1 Progress. Retrieved from: https://www.morgan.edu/technology-transfer-and-intellectual-property/carnegie-r1-progress.

National Academies of Sciences, Engineering, and Medicine (NASEM). (2019). *Minority serving institutions: America's underutilized resource for strengthening the STEM workforce*. The National Academies Press. https://doi.org/10.17226/25257

National Science Foundation. (2020). Louis Stokes Alliances for Minority Participation. Retrieved from [https://new.nsf.gov/funding/opportunities/louis-stokes-alliances-minority-participation/nsf20-590/solicitation]

NCES (2019). Trend Generator. Retrieved from: https://nces.ed.gov/ipeds/TrendGenerator/app/trend-table/4/24?trending=row&valueCode=5&f=33%3D5&rid=35&cid=36

NCES (2021). Historically Black Colleges and Universities. Retrieved from: https://nces.ed.gov/fastfacts/display.asp?id=667

NCES. "Digest of Education Statistics, 2019." nces.ed.gov, 2019. https://nces.ed.gov/programs/digest/d19/tables/dt19_313.10.asp.

NCES. "Digest of Education Statistics, 2020." nces.ed.gov, 2020. https://nces.ed.gov/programs/digest/d20/tables/dt20_313.10.asp.

NCES. "Digest of Education Statistics, 2021." nces.ed.gov, 2021. https://nces.ed.gov/programs/digest/d21/tables/dt21_313.10.asp.

NCES. "Nsf.gov - Table 31 - NCSES Higher Education Research and Development: Fiscal Year 2018 - US National Science Foundation (NSF)." ncsesdata.nsf.gov, 2018. https://ncsesdata.nsf.gov/herd/2018/html/herd18-dt-tab031.html.

National Science Foundation Fact Sheet. "NSF By the Numbers" Retrieved from: https://www.nsf.gov/news/factsheets/Factsheet_By%20the%20Numbers_05_21_V02.pdf

North Carolina A & T. (2024a). Initiatives and Strategic Plan. Retrieved from: *https://www.ncat.edu/about/initiatives/index.php*

North Carolina A & T. (2024b). R2 to R1 Frequently Asked Questions. Retrieved from: *https://www.ncat.edu/about/initiatives/r2-to-r1/faqs.php#:~:text=There%20are%20three%20classifications%20for,(doctoral%2Fprofessional%20universities)*

Riddick, J. C. (2024). *Good News in the Progress Toward Top-Tier Research Status for HBCUs?.* Center for Security and Emerging Technology. Retrieved from: https://cset.georgetown.edu/article/good-news-in-the-progress-toward-top-tier-research-status-for-hbcus/#:~:text=The%2011%20R2%20HBCUs%20are,Prairie%20View%20A%26M%20University%2C%20Prairie

Shulman, L. S. (2001). The Carnegie classification of institutions of higher education. *Menlo Park: Carnegie Publication*.

Skerritt, A. (2021). "Retiring CAFS Professor/Associate Dean Donates Textbooks to FAMU DRS." www.famu.edu, 2021. https://www.famu.edu/about-famu/news/retiring-cafs-professor-associate-dean-donates-textbooks-to-famu-drs.php.

Spillane, J. P., Halverson, R., & Diamond, J. B. (2004). Towards a theory of leadership practice: A distributed perspective. Journal of Curriculum Studies, 36(1), 3-34.

Weissman, S. (2022). Striving for the "Gold Standard'. *Inside Higher Ed.* Retrieved from: https://www.insidehighered.com/news/2022/11/02/some-hbcus-strive-r-1-status-record-research-dollars

Weissman, S. (2023). As Affirmative Action Ends, HBCUs Wait or Plan for the Fallout. *Inside Higher Ed.* Retrieved from: https://www.insidehighered.com/news/diversity/race-ethnicity/2023/07/12/affirmative-action-ends-hbcus-wait-or-prepare