

ABSTRACT

LLOYD, ANDREA N. E. An Investigation of Research Partnerships between Historically Black Colleges and Universities and Predominantly White Institutions. (Under the direction of Denis O. Gray.)

The creation of collaborative partnerships between historically black colleges and universities (HBCUs) and predominantly white institutions (PWI) is regarded as a very promising mechanism for strengthening the educational pipeline for student populations that are underrepresented in research fields of study and for strengthening the research infrastructure of HBCUs. In spite of the growing popularity of HBCU-PWI research partnerships, there is virtually no data on the characteristics of these partnerships and the factors that affect partnership outcomes.

The current research sampled a population of HBCU-PWI partnership principle investigators (HBCU PIs, n=8; PWI PIs, n=8). For the purposes of comparative analyses, a sample of PWI-PWI partnership PIs (n=10) also was obtained. Partnership PIs responded to forced-choice and open-ended items during a structured interview. Based on their responses, the major characteristics of these partnerships are described, and comparisons are made between the PI groups. Regression analyses were performed to determine which factors predict partnership outcomes, including satisfaction with the partnership process and project outcomes, perceptions of partnership success, and PI willingness to participate in similar partnerships in the future. Qualitative analyses of responses to open-ended interview items were also conducted. Study results indicate that PIs of HBCU-PWI partnerships regard their partnerships as successful and are satisfied with project outcomes and partnership processes. Furthermore, the data show that HBCU-PWI partnerships have goals that are more focused on the research training underrepresented groups than do PWI-PWI partnerships. The extent to which university resources were allotted for PIs' participation in their partnerships, PI perceptions of partner capability, the location of face-to-face meetings, and the number of partners involved were found to predict some partnership outcomes. Implications for partnership strategy and public policy are also discussed.

An Investigation of Research Partnerships between Historically Black Colleges and
Universities and Predominantly White Institutions

by
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DEDICATION

This work is dedicated to God who has given me Jesus Christ, my husband Garrett and my children, Solomon and Noah. Together, they have been conduits of wonderful blessings, have given me strength, and have constantly reminded me to *count it all joy*.

BIOGRAPHY

Andrea Lloyd was born February 25, 1974 in Kinston, North Carolina. She lived there with her mother, father and sister Kristi until her graduation from Kinston High School in 1992. She received a degree in Animal Science in 1996 from North Carolina State University. From 1997-1999, she served as a US Peace Corps volunteer in Ecuador's community of Chontillal, Esmeraldas. There she led her community in the creation of a demonstration farm that served as a both a model farm and a teaching station for integrated, sustainable farming techniques. Impressed with the importance of knowing how to work effectively with communities, she came back to the United States, in search of a graduate program that would further her understanding of community. As a graduate student in Psychology, she has instructed behavioral research methods classes and has worked as a project manager for the National Science Foundation Industry University Research Cooperative Center's Evaluation Project under the direction of Dr. Denis O. Gray. Also during her time as a graduate student, she has become the wife of Garrett Lloyd and the mother of two boys, Solomon and Noah. She is looking forward to developing research that reveals the effects that environmental burdens have on already disenfranchised communities.

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Introduction

Due to the age of current U.S. workforce members and recent trends in the competitive efforts of other nations to retain native talent for their own labor force, the U.S. workforce profile is expected to soon indicate a slowing in the growth rate of those available to work in the Science and Engineering (S&E) fields (National Science Board, 2004). Recent numbers indicate that the implementation of new technologies, which tend to be the product of S&E research, is responsible for 70% of the growth of the U.S. Growth Domestic Product (Bromley, 2004). Hence, the U.S. faces the challenge of finding ways in which to sustain the competitive edge it has enjoyed due to a strong S&E workforce. This situation implicates the need for increased growth in the innovative job sectors, particularly S&E. Currently, workforce trends show a rapid increase in the numbers of non-Hispanic whites leaving S&E employment with a decrease in non-Hispanic whites earning S&E bachelor's degrees (National Science Board, 2004). Consequently, a surge in growth in the S&E fields is largely dependent upon the recruitment of traditionally underrepresented groups into these fields of study (Mendoza & Johnson, 2000).

African-Americans comprise one group that could significantly facilitate the nation's efforts to maintain economic competitiveness. In support of this claim, recent literature specifically promotes engaging more African-Americans in S&E to develop relevant interests early in the educational process (Holt, 2002). Equally important is maintaining the S&E focus of these students throughout their educational pursuits and addressing the very real obstacles that face talented African-American students that go on to enroll as S&E majors (Rawls, 1991; Tanaka & Gladney, 1993). Historically Black Colleges and Universities (HBCUs) have played a vital role in the recruitment and subsequent education of such students. Unfortunately, while

HBCUs have missions to be attentive to the particular needs of African-American students, the institutions themselves are faced with administrative challenges. In regards to science research, HBCU administrators and researchers cite a shortage of capital and knowledge resources as the root of their problems (Adessa & Sonnenwald, 2003; Rawls, 1991; L. Uitenham, personal communication, September 9, 2004)

The conditions faced by African-American students eligible for pursuing careers in science, mathematics and engineering and the HBCUs that have undertaken the task of educating them are very relevant to the rationale for this study. For this reason, the next section reviews information illuminating the challenges faced by these individuals and institutions and further highlights the possible benefits and disadvantages of research partnerships between HBCUs and predominantly white institutions (PWIs)¹.

Rationale

Pipeline Problem

Barriers to success in science, technology, engineering and mathematics (STEM) fields for African-American students occur at the personal, group, institutional levels and at state and national policy levels (Tanaka & Gladney, 1993; Wilson, 2000). In Wilson's characterization of the problems that these students encounter at the elementary and secondary education stages, he includes the reality of the conditions of their schooling experience. For example, the schools found in inner cities often have low quality laboratory facilities (Wilson, 2000). Tanaka &

¹ In 2005, the Carnegie Foundation published a framework that identifies three categories of doctorate-granting institutions: 1) research universities with a very high level of research activity, 2) research universities with a high level of research activity and 3) doctoral/research universities. A university's inclusion into one of these three groups is based on the number of doctoral degrees it awards and a multi-measure index of research activity. The Carnegie Foundation's 2005 revised framework does not include historically black colleges and universities as a separate category; these universities now are found elsewhere in the new classification system. However, for the purposes of this study, "HBCU" will refer to any historically black college or university, and "PWI" will refer to any predominantly white institution, regardless of its level of research activity. ("The Carnegie Classification of Institutions", 2005)

Gladney (1993) add that at the pre-college level, high school students are not swayed to develop interests in science due to improperly educated science teachers and a disconnect between teachers, scientists and students. Alternately, minority students who live in suburban areas and attend predominantly white schools are likely to suffer discrimination and racism. Often, however, cultural differences between the student's home and the institution are responsible for high suspension rates for African-Americans. Some of the cultural factors identified as those that cause discrepancies in school achievement for minorities include racial and ethnic segregation in schools, language and cultural biases and school practices, limited academic achievement of students, dropping out of school, limited school financing, poor- or low-quality teacher-student interactions, tracking and curriculum differentiation. The result is an under-representation of these minorities in college due to inadequate preparation for college programs, especially those in the math and sciences (Wilson, 2000).

Given that a student has achieved overcoming all of the aforementioned barriers, with or without the aid of educational programs, she still must effectively adjust to institutional climates existing within her chosen universities. The culture of STEM programs is competitive and rigorous. Minority students must face this campus "sub-culture" while dealing with the ramifications of racism that may exist campus-wide and cause a climate of isolation. Racism is often manifested in the tendency of faculty to have low expectations from minority students and the absence of African-American faculty in STEM programs at traditionally white colleges and universities. These factors easily combine to convince African-American students they (and no one who looks like them or is from a similar background) do not have the ability to successfully pursue STEM careers (Wilson, 2000). *Minority STEM students are also faced with financial*

difficulties, poor pre-college preparation, and poor faculty attitudes toward teaching and advising (Tanaka & Gladney, 1993).

Contributions of HBCUs

Historically Black Colleges and Universities (HBCUs) were created in response to racial segregation in higher education and the resulting unmet needs of African-American citizens. Trent and Hill (1994) contend that despite the racial, financial and legal challenges that HBCUs continue to encounter, they have maintained a critical position in the progressive education of African-American students seeking baccalaureate and graduate degrees. Due in part to the enforcement of desegregation laws in higher education settings, traditionally white colleges and universities (TWCUs) largely have been responsible for the increased enrollment of African-Americans; however, HBCUs are disproportionately responsible for the degrees actually awarded to African-Americans. Statistics relevant to the disproportionate awarding of degrees to African-Americans by HBCUs include those showing the percentage of bachelor's degrees earned by these students in general areas of science and engineering. Reports show that although HBCUs comprise only about 4% of the nation's four-year colleges and universities, granted about a third of all science and engineering degrees earned by African-Americans in 1998 and 2000 (Babco, 2003; National Science Board, 2004). Babco (2003) also reports that during the 2000 academic year, in the particular fields of mathematics, physical sciences and computer sciences, close to half of these bachelor's degrees were awarded by HBCUs (44%, 43.5% and 39.8% respectively). Finally, more than half of African-Americans who go on to receive doctoral degrees in most science fields have earned their bachelor's degrees from HBCUs. In fact, during the five year period 1997-2001, of the top 38 science and engineering baccalaureate origin institutions, HBCUs represented 52.9% (Babco, 2003).

The success of HBCUs and their heavy contributions to the education of African-Americans lie in the universities' demonstrated abilities to provide a more accessible nurturing environment that supports amenable social and mentoring relationships (Rawls, 1991; Trent & Hill, 1994). Trent and Hill posit that the continued success of these universities rests on the ability of the HBCU to improve its efficiency and proficiency and to prove its special role in American higher education as a setting that provides support for a broad range of students, as these institutions serve members of numerous racial and ethnic groups. Overall, HBCUs contribute to the development of pools of human resources that would not have been developed had those institutions not been there (Rawls, 1991; Suitts, 2003).

Challenges Faced by HBCUs

Unfortunately for HBCUs, more PWIs are recruiting African-American students and faculty, which reduces the available pool of quality African-American students for matriculation into HBCUs. This shortage of available students ultimately affects alumni giving for HBCUs, who are already facing financial difficulties. These difficulties are reflected in the dearth of well-equipped, state-of-the-art labs. As a result, these institutions are not able to compete with larger, better-equipped universities for faculty by boasting "world class" research programs. Also, the needs of African-American students to maintain ethnic culture is just as important as, if not eventually out-weighed by, a need to associate with the scientific "culture" of one's chosen field (Rawls, 1991). The importance of facilities to aid in the development of the scientific culture is reflected in a statement from an interview of a black professor at Duke University:

“People are turned on to chemistry, by and large, because of the excitement of the laboratory experience. Science is a culture, and part of that culture rubs off on you when you are in the lab all the time. Unless a school has the personnel and the resources to run an excellent laboratory, it is a real problem for it to mount an exciting undergraduate program in chemistry. And many minority students are going to minority schools where this situation does not exist. It gets very difficult for them to be turned on to chemistry even though their teachers are very dedicated, are very good mentors, and are excellent teachers.” (Rawls, 1991, p. 24)

The development and maintenance of student excitement is cited as only one of the faculty-level concerns. Professors at HBCUs are also overly burdened with heavy teaching loads and would have little time to do research, even if the appropriate facilities were available (Rawls, 1991).

Considerations of HBCU-PWI Partnerships

Collaborative partnerships between HBCUs and research universities are regarded as one prospective mechanism for effectively assuaging the outcomes of the conditions that characterize many HBCUs (Roessner & Russell, 2003; Tanaka & Gladney, 1993). Over the last 25 years, collaborations between HBCUs and PWIs have become more prevalent (“The University of North Carolina”, 2002) because the often under-developed capacities of students and faculty at HBCUs are attributed to a lack of adequate resources for education, training and research (Advisory Committee on Student Financial Assistance, 2002; Rawls, 1991; Roessner & Russell, 2003), and partnerships are considered a mechanism for improving access to those resources (Tanaka & Gladney, 1993). A second reason for this trend is funding agencies and

government officials have become more aware of the resource discrepancies that exist between dissimilar institutions such as HBCUs and PWIs. For instance, this awareness led to the creation of the White House Initiative on Historically Black Colleges and Universities. Originating under the Jimmy Carter administration in 1980, an initiative was created to improve minority access to quality education and to improve the access of HBCUs to federally sponsored programs (U.S. Board of Education, n.d., A Brief History section). More recently, the US Senate has proposed increases in funding to support programs that attract and retain minorities into science and engineering fields (Leath, 2002). Though there are a rising number of partnerships between HBCUs and PWIs and the importance of them is clear at both the university and federal levels, an extensive literature search has rendered very little research focused on the characterizations, processes and outcomes of these particular types of arrangements.

In place of empirical research focusing on HBCU-PWI partnerships are varying expert opinions reflecting the perceived value of these relationships. Experts regard these partnerships either as being effective in regards to desired outcomes or as actually creating problems for the collaborating institutions. Various authors have argued that collaborations between members of HBCUs and majority research institutions are an effective means of increasing research opportunities for minority students and building a research infrastructure within the HBCU (Suitts, 2003; Tanaka & Gladney 1993). These authors also assert that the partnerships are useful for exposing students from HBCUs to other campuses, graduate school faculty and research environments not available at their own universities. Especially important are programs that couple minority students with researchers for the purpose of training these students in the study of that field. These programs are considered valuable for presenting

students with role models while providing contact between the faculty and the student. Above all, students are expected to become excited by their fields of study, which should decrease the likelihood of attrition (Tanaka & Gladney, 1993). Interviews conducted with faculty involved in research with HBCU undergraduates similarly suggest that research partnership outcomes are meaningful for students because these experiences allow HBCU students to compete with other students at a national level (Roessner & Russell, 2003). However, in a focus group session held at a Federal Demonstration Partnership meeting, it was shown that others are concerned with issues at the university level that arise from HBCU-PWI. Attendants of the session stated that partnering HBCUs with larger institutions might lead to relationships whereby the larger institution uses the smaller one to increase diversity in its grant application while the smaller partner gets little help in return. Also, it was expressed that faculty at HBCUs were thought to prefer their independence to the dependency brought about by these partnerships. Additionally, in some of these partnerships, the faculty and students of the HBCU sense condescending attitudes of the faculty of the larger institution (Federal Demonstration Partnership Membership Standing Committee, 2003). Clearly, this undermines the respect needed at the individual level for successful partnering relationships. This perspective suggests only one of the issues that could occur in HBCU-PWI partnership contexts and has prompted the examination of partnership situations for other influential factors. Hence, the next section reviews literature that helps to elucidate the nature of collaborative relationships.

Literature Review

Both theoretical and empirical literature have been explored to understand HBCU-PWI partnership processes. Specifically, the literature search represented in the following review reflects theoretical frameworks formed to understand the forces that compel organizations to

collaborate and the processes that affect partnership outcomes. Also presented here are qualitative investigations conducted to explore the perspectives of collaborating individuals. As most claims of the importance of these factors reflect the perspectives of either the administrators forming the collaboration or of the collaborating researchers themselves, these studies lend first-hand accounts of factors suggested to contribute to and impede the success of the sampled collaborative projects. Research also found to be relevant to this study explains the relationship of factors such as communication, trust, leadership and power to the outcomes of collaboratory relationships in inter-firm and inter-university research and development (R&D), education and design contexts. In the extant literature, there is little agreement on whether to call the focal relationship between organizations collaborations, co-operations, alliances, or partnerships. Hence, the following review is equally inconsistent and considers these names interchangeable.

Empirical Literature on HBCU-PWI Partnerships

The existing literature exposes factors of specific concern to collaborations between distally located institutions. Cramton (2002) presents a conceptualization of communication as one of the micro-processes affecting partnerships. She offers that computing and telecommunication advances have been detrimental to the building of trustful relationships when the partnering institutions are geographically dispersed. She cites a lack of “mutual knowledge” as the basis for mistrust and posits that such situations occur at the institutional level when there are disparities in technology abilities, social norms and cultural practices. Also, there are often differences in what communicators identify as salient information, in expectations of reply rates, and in to whom it is believed information should be disseminated. As a result, information that is gained in face-to-face communication, such as non-verbal cues,

or in verbal communication, such as tone of voice, is lost, leading to misinterpretation and loss of context. When this occurs, collaborators tend to attribute misunderstandings and collaboration failures on the partner's shortcomings instead of the situation. According to Cramton, the mutual knowledge that is needed for more successful partnerships can be achieved through pre-collaboration planning, attempts to align situations, anticipation of situational differences that cannot be resolved through alignment and attention to communication systems and norms (Cramton, 2002).

Although Cramton (2002) points to possible issues of concern for inter-organizational collaborations in general and others have noted their observations of problems with and the potential of HBCU-PWI partnerships (Federal Demonstration Project, 2003; Roessner & Russell, 2003; Tanaka & Gladney, 1993), an extensive literature search exposed relatively few empirical studies that address issues specific to collaborative relationships between HBCUs and PWIs. Research describing the exploration of research partnerships between HBCUs and doctoral/research universities by Adessa & Sonnenwald (2003) was the first study of relevance called to the attention of the present author. The references listed by Adessa & Sonnenwald were investigated for possible empirical analyses of factors affecting HBCU-PWI partnerships. None were found, so the quest for empirical studies of these partnerships continued with the keyword search "historically black colleges and partnerships" in the Web of Science, WorldCat, Academic Search Elite, GPO and Google Scholar search engines. Alternately, the same phrase was entered into all the listed search engines, except the word "partnership" was exchanged for "alliance", "collaboration", and "cooperation", "co-operation". Search hits numbered over 10,000. These sources were concerned with partnerships across a wide variety of disciplines that these academic institutions have with specific populations (e.g., the aging, at-risk youth),

community structures (i.e., high schools, churches, civic groups), industries, government entities, other minority serving institutions and other historically black institutions in the United States and Africa, but none with research extensive universities. Therefore, in an iterative process, the author narrowed the search phrase to “*historically black college and partnership and research extensive university*”. The same series of searches for empirical studies was conducted, exchanging *alliance, collaboration, and cooperation, co-operation* for *partnership*, and exchanging *research university* for *doctoral/research university*, in accordance with the new Carnegie University Classification system (“The Carnegie Classification of Institutions”, 2005). Only one source was found that explained a program to train doctoral students for faculty positions; however, it only briefly mentioned HBCUs as one of several partnering universities and did not describe factors affecting the collaboration. In a third attempt to get direction, catalog title, keyword and subject searches on the same two phrases were done at four different universities to identify books that might have chapters describing HBCU-PWI partnerships and reference lists with relevant sources. This search did elucidate the conditions under which HBCUs often operate and expose HBCU-PWI partnership issues of concern and provided historical references; however, no empirical sources with the desired focus were cited. Soon after, the author was presented with a recently completed manuscript of a study presented by Weston, Baker & McMillan (2005) at a conference; however, no other empirical studies were cited in the manuscript. Consequently, only two empirical investigations focused on HBCU-PWI partnerships have been discovered (Adessa & Sonnenwald, 2003; Weston et al., 2005). Correspondence with other researchers currently doing work with this focus has confirmed the paucity of published studies of HBCU-PWI partnerships. Thus, the following review of studies

begins with the two pieces of research found that exposes issues salient to processes of HBCU-PWI educational and research partnerships.

Exploration of an HBCU-PWI Educational Partnership

As mentioned previously, partnerships between HBCUs and PWIs are often created in response to a lack of resources. A lack of human resources in the form of campus racial homogeneity creates a homogeneous set of perspectives and limits the potential for novel ideas. Understanding this, administrators of the liberal arts programs of two dissimilar universities formed an educational partnership (Weston et al., 2005). The PWI partner, University of Colorado, had a campus population that was not representative of the racial makeup of its state; the HBCU partner, Dillard University, mostly serves African-American or foreign students. The goals of the relationship were to expand the worldview of students, to establish long-term relationships between faculty and administrators from the respective universities, to develop and use shared educational materials, to promote student exchanges and to establish a teaching excellence program at the HBCU. In order to reach these objectives, the partnership created a shared humanities course that utilized videoconferencing technology as one mode of communication for students and faculty. Faculty engaged in face-to-face meetings during the implementation stage to learn about each other's institutions and to plan and design the course and its materials. Students also communicated with faculty and each other via a website discussion forum (Weston et al., 2005).

Weston et al. (2005) have conducted a case study to examine factors that affected the arrangement. The researchers obtained student and faculty attitudes and perceptions of issues concerning the collaboration using student surveys and faculty interviews. Other data collection methods included direct observation and video taping of the course, observations and

field notes of regular meetings between institutional partners and analysis of syllabi and web discussions between faculty and students. Analysis of interviews and observations exposed difficulties encountered during the partnership including complications with the videoconference link and class scheduling, increased and ambiguous workloads and communicating at a distance. Additionally, student attitudes towards the course were mixed. Both sets of students considered one goal of the partnership, to promote diversity, to be commendable. However, they felt that the nature of the interaction precluded the achievement of this goal. In fact, racial issues surfaced during the partnership, and these problems required open discussion of commonalities and differences in backgrounds. According to students at Dillard University, Colorado University students were overly cautious in expressing their opinions about race. As a result, these discussions introduced the complexity of achieving the desired diversity outcomes. Additionally, these discussions were challenged by problems with the videoconferencing link. The researchers conclude that focusing on logistics, such as technical aspects, structuring the curriculum around diversity goals and providing faculty professional development for partnering, would improve shared course outcomes (Weston et al., 2005).

Exploration of an HBCU-PWI Research Partnership

Adessa and Sonnenwald (2003) have conducted exploratory research to expose issues affecting the research of four teams conducting collaborative research. Each team was composed of faculty from both HBCUs and PWIs; the faculty members from the PWIs were all either Caucasian or Latino, while the faculty members from the HBCUs were Black or Caucasian. Though all teams were conducting research projects concerned with the natural sciences, some of the teams were associated with an R&D center while others were associated

with an educational center. Using a qualitative approach, Adessa and Sonnenwald conducted nine interviews with the teams' faculty and post-doctoral fellows affiliated with both university types; all interviewees were male.² Subsequent to the transcription of recorded interview data, the data were submitted to an open coding analysis so that themes and patterns could be identified. Then, axial coding analysis was done so data could be organized into those themes and patterns. The results revealed that not only were there disparities in resources, but that aligning those resources was crucial to the perceived success of the project. The resources found to be relevant in the progression of these projects were a) time available for the principal investigator to devote to research-related activities, b) tangible goods and services such as money, lab equipment and services and infrastructure support, c) human resources such as undergraduate lab assistants, postdoctoral researchers and tenured co-investigators and d) existing knowledge, which is what each team member already knows about the area of research for the collaboration (Adessa & Sonnenwald, 2003).

According to the data, eradicating all discrepancies in resources among the team members was not perceived as important. What was considered crucial in the perceived success of two of the four projects was resource alignment or the appropriate allocation of resources to collaborators so that they could achieve project goals. For example, at HBCUs, heavy teaching loads are common and have an adverse effect on the amount of time that can be used for research (Rawls, 1991). Hence, time available for collaborative research is a resource that must be aligned for the sake of successful project outcomes. In one of the projects, remedial planning to align resources resulted in perceived project failure, while planning to achieve resource alignment before implementation led to project success. Another revelation

² Note that number of interviewees is not known.

produced by the data analysis was that in one team, because the researchers from HBCUs were less aggressive in planning for the project due to their relatively small amount of research experience and the PWI researchers took for granted the ability of the HBCU researchers to collaborate in the same manner as those at PWI-like institutions, there was a failure to plan for resource alignment. Consequently, the researchers of this study concluded that resource alignment must be achieved before projects begin and must be done in accordance with project goals as well as with institutional cultures (Adessa & Sonnenwald, 2003).

Summary of Literature on HBCU-PWI Partnerships

Both Weston et al.'s (2005) single case study of an HBCU-PWI educational partnership and Adessa and Sonnenwald's (2003) examination of four research project teams consisting both of members from HBCUs and from PWIs have shown empirically that communication, cultural and racial differences, a lack of consideration of those differences and a misalignment of resources available to the collaborators contributed to the challenges of inter-university partnership. However, both studies are limited in scope due to the small number of project teams examined. Consequently, the external validity is quite small. For Adessa and Sonnenwald's study, this is because findings are based on projects located in one geographic area and from only two disciplines. Generalizations also are difficult to make based on findings from Weston et al.'s study because they examined just one relationship. Still, the findings from these two studies highlight the importance of understanding the institutional-level motivations for entering into partnerships, the processes involved in implementing collaborations in order to achieve common and divergent goals, and factors contributing to and hindering the achievement of those goals.

Research Goals

Because very little is known about the basic characteristics of these partnerships, the first and especially significant goal of this study is to describe key partnership variables. Also, because a wide search for literature explaining factors salient to HBCU-PWI partnership outcomes revealed only two sources of information, this study has a second goal of exploring additional factors that are linked to the success or failure of HBCU-PWI educational and research partnerships. Due to the small amount of extant literature on HBCU-PWI partnerships, literature on inter-organizational alliances and R&D collaborations were consulted for illumination of factors relevant to the focal relationships. Accordingly, the discussion that follows begins with an overview of theoretical motivations for the adoption of inter-organizational partnerships.

Theoretical Perspectives on Inter-Organizational Partnerships

R&D partnerships are ubiquitous forms of inter-organizational relationships that have grown out of the nation's need to be globally competitive (Boer, 1988; Cornell, 1988; Rahm, Kirkland and Bozeman, 2000) and more specifically, out of industry members' recognition of the idea that no one organization can provide all the resources it needs to generate all the technology it requires to be sustainable in national and international markets (Boer, 1988). The most common R&D partnerships exist between R&D firms and in the form of linkages between industries and universities. Practitioners cite common specific reasons for collaborating with other businesses are to win credibility, to define product specifications and to gain access to markets (Goodman, 1988). The motivation to form industry-university partnerships frequently is stated as the industry's need to gain access to students and faculty with state-of-the-art technology and up-to-date knowledge. Universities cooperate with industries to access those

industries' scientific and technical information and to expose students to practical problems, government funds for research and avenues of future employment after graduation. Generally, industry-university partnerships exist in the form of the transfer of university-developed technologies to the industrial organization (Rahm, Kirkland and Bozeman, 2000).

Inter-university partnerships are another rising form of collaborations (Gray, Schneider & Lloyd, 2005) that share with industry –university partnerships the goal of improving the competitive position of the US in global markets. However, these relationships have a unique set of specific motivators based on institutional differences. One of the expressed goals of inter-university partnering is to improve faculty and student access to state-of-the-art equipment and labs, to provide educational opportunities for students, and to provide research training and opportunities to both faculty and students at both partnering institutions (Adessa & Sonnenwald, 2003; Roessner & Russell, 2003; Weston et al., 2005). However, theorists have suggested other reasons an academic institution might seek partnership with another university. Therefore, the theories presented here were developed to describe motivations for inter-organizational partnership adoption. Although all inter-organizational partnership theories are explained, some of the theoretical perspectives reviewed are only highly relevant in private sector contexts. Others provide hypotheses applicable to the reasons university administrators might consider inter-university partnerships an effective mechanism for achieving the goals of their academic institutions. The connections between relevant theories and HBCU-PWI partnerships are illustrated.

Strategic Choice Theory

One theory that applies to motives behind the formation of R&D partnerships is strategic choice theory. This perspective grew out of the idea that organizational partnerships

are positioning themselves for an increase in market power and competitiveness. Forming alliances might be a strategy by an organization to maximize its ability to offer attractive products or services, to increase efficiency, or to reduce costs (Harrigan, 1988; Koh & Venkatraman, 1991; Powell, 1990; Rockwood, 1983). An alliance also could be a mechanism for gaining access to new markets and technologies more quickly than could be achieved with a single organization and to acquire knowledge across the boundaries of the organization. Because of the breadth of this theory and the difficulty in analyzing inter-organizational processes in accordance with this theory, Barringer and Harrison (2000) suggest sorting relationship strategies into groups according to 1) relationships that increase market power through the creation of barriers or monopolies, 2) relationships that increase political power or influence, 3) relationships that increase efficiency in production, research and marketing and 4) relationships that create product or service differentiation. This last tactic suggested by Barringer and Harrison implies that strategic choice theory can be applied to collaborations that are viewed as the means by which an institution can maximize its ability to offer a more attractive product, such as its graduates and quality research. Additionally, Barringer and Harrison's third listed strategy suggests that universities might partner in order to increase its efficiency by improving its knowledge base, which will lead to more efficient teaching or research.

Though this theory does not explain why particular strategies are not successful across contexts, it serves as an "umbrella" theory that incorporates the motivations arising from the other inter-organizational collaboration impetus theories discussed in this section.

Resource Dependence Theory

Resource dependence theory is well aligned with many of the stated perspectives on incentives for partnering. The theory's grounding in open system's framework of exchanges between organizations and the environment is apparent; resource dependence theory states that resources must be obtained from outside sources for organization survivability and competition, thereby creating dependency between organizations (Barringer & Harrison, 2000). In practice, an organization may attempt to accomplish its goals by forming partnerships with another organization to fill a gap in resources (Mitchell & Singh, 1996). For larger organizations, the resource need often is in the form of knowledge and entrepreneurial energy; for smaller organizations the resource need is frequently financial (Fisher, 1996), such as in the need to access more cost-effective services. Conceivably, a partnership could create a larger brain trust and finances for the production of new products or services (Browning, Beyer, & Shetler, 1995; Dyer & Singh, 1998). Partnering with large organizations also provides the resource of power, which might be relevant for smaller organizations needing more market influence. For example, one rationale for inter-university partnering based on resource dependency theory is that universities adopt partnership activities because of a lack of knowledge resources that are normally provided by a diverse and experienced faculty and student body (Weston et. al, 2005). Also, these partnerships could fill the various resource gaps institutions experience due to low financial resources (Roessner & Russell, 2003; Tanaka & Gladney, 1993).

Resource dependence theory is not sufficient to completely explain the array of reasons why R&D organizations partner, and neither are the cognitive processes through which R&D managers make the choice to partner over other options of filling resource gaps clarified with

this theory. However, it does provide a way in which to begin testing hypotheses that weigh the advantages of partnering against its disadvantages (Barringer & Harrison, 2000).

Stakeholder Theory

An organization's inclination to form alliances with stakeholders, or those that have value in helping the institution achieve its objectives, is the central tenet for stakeholder theory (Axelrod, Mitchell, Thomas, Bennett & Bruderer, 1995). According to theorists, this strategy is undertaken so that organizational goals achieve alignment with stakeholder interests. Such a tactic would be appropriate in situations where positive organizational outcomes are closely tied to the knowledge and needs of the stakeholder. Thus, the alliance can serve to reduce environmental uncertainty for the organization (Kraatz, 1998), as is the case with collective lobbying (Barringer & Harrison, 2000) or industry-university partnerships (Feller & Roessner, 1995). The organization's recognition of the need to manage the reciprocal relationship between the organization and its stakeholders is evidenced by the organization's incorporation of the legitimate interests of all relevant stakeholders in its important operational and strategic decisions (Donaldson & Preston, 1995). However, the misleading notion in this theory is that all organizations have the ability to form coalitions with their stakeholders. The impossibility of this is obvious in situations in which a company has thousands of stakeholders. The value of stakeholder theory lies in its ability to conclude that alliances facilitate goal alignment between stakeholders and organizations, though the form of the alliance appropriate for the context is not made apparent (Barringer & Harrison, 2000).

Transaction Costs Economics Theory

Transaction Costs Economics Theory focuses on the expanding of boundary-spanning activities, or external interactions performed by someone belonging to an organization, that

affect that organization's ability to reduce organizational costs (Barringer & Harrison, 2000; Tarant, 2004). This theory proposes that in situations where organizations would seemingly be forced into either buying or making a product, they actually do neither by creating a joint venture with the maker of the desired product. Hence, in these arrangements, partnership formation is motivated by one organization's need to acquire component parts from other organizations in order to complete its goal. The major benefit of joint ventures is the evasion of the transaction costs that would be created by the potential of opportunistic behaviors committed by the component-holding organizations if they were trading partners instead. Other favorable outcomes include avoiding the costs inherent in internalizing an activity and not having to experience the difficulties and costs of managing employees of distant organizations, as would be needed in business acquisitions (Hennart, 1988). Finally, the lowering of overall costs is achieved for all involved organizations because the organizations are allowed to specialize in activities essential to their respective competitive advantages.

Although transaction costs economics theory gives a plausible reason for the formation of partnerships, it has been shown that of the sampled executives involved in joint ventures, none were motivated by transaction costs (Faulkner, 1995). Hence, in actuality, the theory is limited in its ability to explain why most partnerships are formed. Also, because of its narrow economic focus, it does not consider the issues of collaboration at the individual level.

Institutional Theory

Environmental pressure causes organizations to be concerned with increasing their legitimacy in accordance with social norms. Institutional reaction to these pressures is often in the form of creating inter-organizational partnerships (Oliver, 1990; Scott & Meyer, 1983). Theoretically, forming partnerships with organizations that are better established, larger and

more visible, can increase an organization's legitimacy. Alternately, organizations can improve their reputations if they join with other organizations that promote socially desirable objectives. Additionally, in industries that have associations whose members compose the majority of the companies in the industry, a particular organization's lack of membership would hurt that organization's image. Therefore, concern for image is apparent in the motivations for forming inter-organizational relationships in this context (Barringer & Harrison, 2000). Another mechanism for obtaining legitimacy is by conforming or mimicking the strategies of other successful organizations. Using this strategy would lead an organization to form inter-institutional relationships because it sees that other profitable organizations in the industry form them (DiMaggio & Powell, 1983). Institutional theory explains that a smaller, less visible institution would want to partner with a more influential institution in order to improve its competitive position. Motivations related to this theory would likely be at play in relationships in which the faculty of one university has more research prominence than the other. Institutional theory might also apply to inter-university partnerships that are formed due to the existence of R&D centers that encourage inter-university collaboration and make the outcomes of collaboration visible and profitable.

This theory serves to explain the behavior of organizations that enter into partnerships; however, it does not explain the existence of various forms of alliances (Barringer & Harrison, 2000). Also, if an industry's organizations partner because other successful organizations do so, a mono-culture would be created in that industry, thereby decreasing the any chances for creating sustainable competitive advantage (Osborn & Hagedoorn, 1997).

Learning Theory

Learning theory expands upon the idea that organizations can improve their competitive position by acquiring more knowledge; because the knowledge needed is often difficult to price and tacit in nature, instead of endeavoring to buy the knowledge, organizations can form inter-organizational relationships to learn from the original holder of the knowledge (Mowery, Oxley & Silverman, 1996; Simonin, 1997). This form of knowledge transfer is considered very effective for both knowledge transfer and creation (Barringer & Harrison, 2000; Powell et al., 1996). Also, the costs related to learning through exploration activities, such as discovering opportunities for wealth creation, and those related to learning through exploitation activities, such as increasing the organizational productivity, can be shared among organizations if inter-organizational relationships are formed. Inter-organizational relationships motivated by learning might exist in the form of trade organizations. These organizations provide their members with industry-specific information and support. Research consortia are another form of learning-motivated communities. These settings nurture a learning environment for member companies (Barringer & Harrison, 2000). An application of learning theory is seen in inter-university partnerships in which knowledge flows between the universities' students and faculty who conduct research together. Additionally, it is important to note that bodies of knowledge can be furthered or initiated through the research.

Cohen and Levinthal (1990) provide a perspective on organizational learning is relevant for the discussion on inter-organizational partnering. This perspective proposes that organizational learning is based on an organization's absorptive capacity as defined by its ability to acquire *and* utilize external knowledge. The ability to do this is based on the amount of knowledge already possessed by the organization. The types of knowledge important for the

organization exist at the individual level and include basic skills and appropriate contextual knowledge for proper assimilation of new knowledge. This includes situations in which the knowledge to be gained and used is a set of new learning skills. This view suggests that the amount of effort needed to absorb new learning skills decreases with an increase in the amount of knowledge already possessed by individuals in the organization. This can be seen in institutions that utilize inter-university relationships to develop those human resources that are expected to translate into organizational gain. An additional noteworthy implication of this theory is that an institution's absorptive capacity affects the ability of that institution to contribute to an inter-organizational partnership. In this way, it affects the potential success of the partnership (Cohen & Levinthal, 1990).

While learning theory is well developed, its strong focus on skill development and knowledge transfer eclipses a consideration of the costs involved in the training and education activities needed to bring about that development and transfer. It also does not account for intellectual property issues that arise from shared learning experiences and knowledge creation among partnered institutions. The capacity to learn is important at both the organizational and individual levels. Thus, a key conclusion of this perspective is that an organization's prior investment in its individual members' absorptive capacities serves as a basis for the organization's absorptive capacity (Barringer & Harrison, 2000).

Summary of Theoretical Perspectives

These theories are distinguished in the type of information they provide about inter-organizational partnerships in that they explain why or how institutions partner. As discussed, possible institutional-level motivations for HBCU-PWI partnering are explained by resource dependency theory, strategic choice theory and institutional theory. Alternately, while learning

theory and the related absorptive capacity perspective elucidate that academic institutions may partner for the purpose of acquiring knowledge and capitalizing on that knowledge, they also serve to explain the process by which institutions use that knowledge to improve their competitive positions. However, these ideas only describe one process (i.e., decision to adopt partnership strategy) that might occur in inter-organizational relationships. Thus, for increased understanding of HBCU-PWI partnerships, we now turn to literature focused on providing frameworks for linking inter-organizational relationship processes to partnership outcomes.

Frameworks for Inter-Organizational Partnerships

A Framework for Partnership Evaluation

In Brinkerhoff's (2002) review of existing frameworks for evaluating partnerships, she discovered that those frameworks do not assess the quality of relationships among member partners and are too specific in their definitions of indicators for success. In response, Brinkerhoff has proposed a different framework for evaluating partnership relationships and outcomes (Figure 1). Brinkerhoff has utilized the critical friend model as a guide in the creation and proposed use of the framework. The critical friend model emphasizes the value of producing data that incorporates the knowledge and ideas of the intended users (i.e., partnership actors). This model is appropriate for use in evaluations whose results are meant to be useful to those involved with the program being evaluated. This type of action research model combines with the critical friend model to develop meaningful indicators and methods of collection and measurement because they have emerged through a dialogue with the intended users (Brinkerhoff, 2002).

Accordingly, this framework assesses partnerships using indicators for success based on recommendations of member partners. By nature, the indicators are more qualitative and

subjective than those used in previous frameworks. However, the basis of Brinkerhoff's framework also includes novel ideas about mutuality, organization identity, and championing (Brinkerhoff, 2002). As this review of literature progresses, these ideas, along with other factors believed to affect partnerships, will be presented in terms of the approach in which Brinkerhoff uses them in her framework.

As an alternative to frameworks that suggest that programmatic outcomes are caused by partner performance, which in turn, is caused by pre-requisites and success factors, Brinkerhoff (2002) presents a non-linear causal chain for relationship outcomes. This framework proposes five general areas of assessment. They are 1) compliance with prerequisites and success factors in partnership relationships, 2) the degree of partnership practice, 3) outcomes of the partnership relationship, 4) partners' performance, and 5) efficiency. The prerequisites referred to in the first area of assessment are the partners' tolerance for sharing power, a willingness to adapt their operations and procedures for the sake of the partnership, and the existence of partnership champions. The factors affecting partnership success collected from the literature by Brinkerhoff include trust, standard operating procedures, contractual agreements and their degree of formality, support from senior management, ability to meet performance expectations as defined both by constraints beyond the control of the partnership and by the presence or absence of the necessary skills and capacity for reaching partnership goals, clarity of partnership goals, partner compatibility and conflict. It is worth noting that properly assessing conflict requires acknowledging that the absence of conflict may actually be a manifestation of power being used to cause one partner to pursue behavior that is in the best interest of the other partner. Such an interpretation suggests that absence of conflict does not necessarily indicate a mutually beneficial relationship (Brinkerhoff, 2002).

In Brinkerhoff's (2002) framework, these prerequisites and success factors concomitantly affect degree of partnership practice and partner performance. Degree of partnership practice refers to mutuality and organization identity. Indicators for mutuality include equality in decision making, resource exchange, reciprocal accountability, transparency, degree of partner representation and participation in partnership activities, even benefits, and mutual respect for each partner due to its indispensability in regards to what it contributes to the partnership. Because of the connections between power, decision-making, resources and accountability, power imbalances can severely compromise the degree to which organizations partner. Organization identity, the second facet of degree of partnership practice, involves the extent to which partnering organizations remain loyal to their own organizational missions, values and culture while adapting in order to reach partnership goals.

Partner performance, a third area of assessment, contributes to the effects of prerequisites and success factors on degree of partnership practice. Here, Brinkerhoff asserts that objective assessments of partner performance can be based on whether or not partners performed according to their prescribed or agreed upon roles. Contextual indicators of whether the partner performed the roles effectively and efficiently, however, are based on the other partners' satisfaction with that performance (Brinkerhoff, 2002).

The aforementioned success factors combine with efficiency to create a fourth area of assessment. The factors in this area affect the degree to which partner performance impacts the degree of partnership practice and also affect the degree to which partnership performance impacts the outcomes of the partnership relationship. Partnership efficiency implicates the ability of the management strategy to effectively deal with environmental factors in the most cost-reasonable manner. Thus, a competent management strategy requires constant monitoring

of these factors and understanding at what cost specific environmental factors should be appreciated, influenced or controlled (Brinkerhoff, 2002).

The outcomes of the partnership relationship comprise the fifth area of assessment. The indicators of this area relate to the partnership's value-added, or the belief that the partnership yields more than what the partner organizations would have been able to accomplish alone. These value-added effects might be those expected, hoped for, or unforeseen. According to Brinkerhoff (2002), because each partnership is unique in its goals, value-added indicators must be related to the specific partnership. However, Brinkerhoff has categorized value-added indicators as either qualitative or quantitative synergistic outcomes, linkages with other programs and actors, enhanced capacity and influence and multiplier effects such as program extensions and replication or novel programs. A second target of assessment in the outcomes of the partnership is the extent to which the partnership aids the individual partners in meeting their own objectives. It is in this area that Brinkerhoff's framework clarifies the relationship between partner motivation and satisfaction. Since partnering with other organizations requires extra effort, and each respective organization must be motivated to partner, then identifying individual partner drivers and assessing the satisfaction of these motivators creates an indicator of partnership sustainability. The third indicator of successful partnership is the creation of a partnership identity, which is defined as the basis for legitimacy and the "glue" that holds the partners together. The identity includes values and a unique mission that are reflected in the partnership's processes, mechanisms and value-added (Brinkerhoff, 2002).

Brinkerhoff (2002) outlines an assessment methodology that conforms to the described critical friend and action research approaches. The three methods recommended are partner surveys, observation and assessment of processes, and partner interviews. Each method is

meant to be iterative, such that the application of each methodology informs the next. Partner surveys, which should be administered to all partner organizations and staff, will address assessments targets that can be quantitatively measured. Continuous process observation and assessment will include a review of project documents and reports, observations of project meetings and activities and analysis of data collected by all methods. Assessment targets addressed by this method include degree of partnership and exchange of resources. In the third method, partner interviewing, interview protocols should be reflective of the combined outcomes of the partner survey and observation and assessment methods. This method is to be used to explore assessment targets such as organization identity and whether or not partners meet their own objectives through the partnership (Brinkerhoff, 2002).

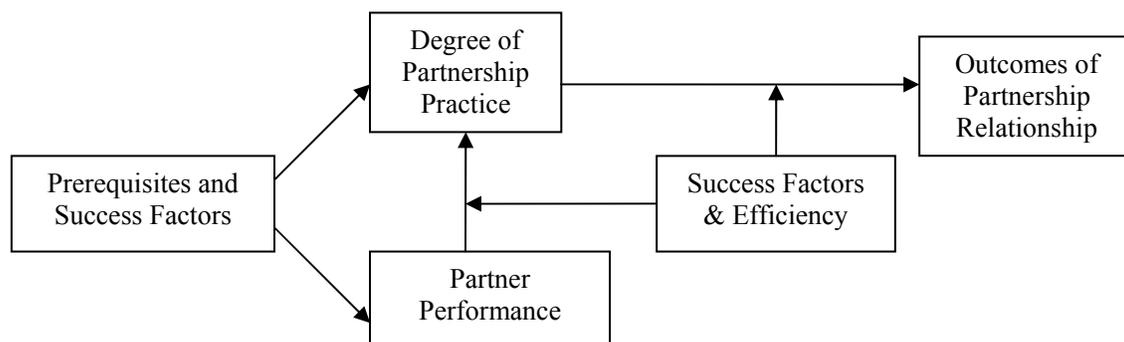


Figure 1. Causal chain for inter-organizational relationship outcomes. J.M. Brinkerhoff, 2002.

Brinkerhoff's (2002) framework is very broad and encompasses several factors that are believed to affect inter-organizational partnerships. For example, Adessa & Sonnenwald's (2003) research on HBCU-PWI partnerships underscores Brinkerhoff's assertion that the ability for each partner to meet performance expectations, as determined by external constraints (i.e.,

resource misalignment) and the partners' capacity for meeting expectations, are success factors for partnerships. Likewise, Weston et al.'s (2005) data reveal that, among other factors, lack of clarity in workloads affected the HBCU-PWI educational partnership. This finding has its place in the part of Brinkerhoff's framework that suggests determination of the division of labor is one aspect of the degree of partnership practice that affects partnership outcomes. Another one of Weston et al.'s findings, that the partnership outcomes were influenced by racial issues, is congruent with Brinkerhoff's assertion that partner compatibility is a success factor for partnership practice that ultimately affects partnership outcomes.

The motivational theories for partnering also are applicable to Brinkerhoff's (2002) framework. Because the individual missions of an organization serve as the primary impetus for considering partnering with another organization, the motivational theories previously reviewed are relevant to what Brinkerhoff labels "organization identity" (i.e., organizational mission) which is contained in the "degree of partnership practice" component of her framework. The next framework presented, as well as the empirical literature that follows, continues to expose aspects of factors influencing partnerships that are reminiscent of Brinkerhoff's framework.

A Framework for Inter-Organizational Processes

Researchers acknowledge that once a partnership has come into existence, despite the best of intentions, collaboration outcomes can be in disconnect with the expectations of individuals and the goals of the organization (Barringer & Harrison, 2000; Huxham, 2003). Huxham (2003) presents a framework for partnership processes that harmonizes, at least in part, with Brinkerhoff's (2002) framework. Huxham's framework reflects processes at the organizational and group levels and juxtaposes the reality of collaboration practice with widely

held beliefs. He theorizes common aims, trust, power, leadership and membership structure to be major actors in themes that describe situations in which visions of collaborative advantage clash with states of collaborative “inertia”. According to the author, those who conceptualize and implement partnerships idealize the “advantage” that the collaboration will allow each organization to achieve something they would not have been able to accomplish alone.

However, interviews with those who collaborate daily expose that they often experience inertia, or disenchantment with the collaboration because of processes that do not further expected goals. In sum, those who manage collaborative relationships often do not seem to consider the complexity of collaborations or recognize situations not supported by common wisdom (Huxham, 2003).

One process theme that is consistent across partnerships is the development of common aims. Normally, it is expected that the goals of collaborating groups be explicitly stated at the onset of the relationship for partnership success (Huxham, 2003). However, in practice there is great difficulty in agreeing on aims, and some aims are assumed, suggesting that getting started on an activity before full agreement on goals can ward off stagnation. Likewise, in Brinkerhoff’s (2002) framework, development of common aims is listed as “a shared common vision for the partnership” and is one of the suggested success factors for partnerships.

Conventional wisdom also seems to dominate partnership management when power, a second aspect of partnership implementation, is considered. The general assumption is that power resides with the organization with the greatest financial resources. Often ignored are the various ways in which power can be exhibited, such as when decisions are made as to whom is invited to join the partnership or when a partnership member exercises power of exit (Huxham, 2003). Another commonly overlooked aspect of power in real situations is the shifting of

power possession dependent upon the stage of the collaboration process. Conceptually, the possessors of power during activities during the start-up phase differ from those who hold power during later phases. Brinkerhoff's framework is an example of one that does not explicitly consider Huxham's assertions of power shifts during the course of a partnership's life. However, it does include in its design linkages between partnership outcomes and mutuality and equality in decision making, resource exchange, reciprocal accountability, transparency, partner representation, mutual respect and even benefits (Brinkerhoff, 2002).

Huxham (2003) however, asserts that as a third theme of partnerships, leadership should be discussed in terms of its structure (i.e., level of involvement by each organization's members and involvement of individuals outside the organizations, such as sponsors) and how this structure influences forms of communication and items of consideration.

Adding to the complexity of collaboration relationships is a fourth theme, membership structure. Membership structure, in turn, is complicated by confusion over who partner members are at any point in time, what each member is expected to add to the partnership, the morphing nature of the partner organizations' structures and the inter-connectedness of those organizations. Huxham (2003) concludes that such a membership structure renders any partnerships' trust-building and power management efforts extremely fragile. Here, Brinkerhoff's (2002) framework serves as an expansion on Huxham's theory by suggesting that membership structure's influence on the partnership lies in each member's influence on and use of core constituencies and the influence of the individual member identity on the identity of the partnership.

A fifth dimension of partnerships is trust. Both Brinkerhoff (2002) and Huxham (2003) consider this a success factor for partnerships. However, in Huxham's framework, conceptions

about trust are presented in a form contrary to the traditional thought that trust must exist before any type of collaboration success is achieved. In actuality, collaborators often begin the relationship with suspicion since many partnership formations result from top-down decisions (Huxham, 2003). The focus, Huxham suggests, should be on trust-*building*. In complementary literature, Vangen & Huxham (2003) use extensive data on trust to provide insights on the nature of trust and to create a framework describing a trust-building loop. This is done in the context of the management of trust in inter-organizational collaborations. The data obtained for this study comes from Vangen & Huxham's recordings of the expressed experiences, views, action-centered dilemmas, and actual action of participants of collaborations. By integrating literature with data, the researchers were able to identify four types of trust. They include: a) competence trust, which is based on expectations, b) contractual trust, which is built on agreements, c) goodwill trust, which is trust based on repeated positive interactions and d) trust based on the reputation of the potential partner (Vangen & Huxham, 2003).

Trust, they assert, implies taking the risk that is required for all collaboration types. They also suggest that trust leads to risk-taking. This has led to the creation of the trust-building loop which depicts trust building as a cyclical process. As their model suggests, an increase in the support for collaborations encourages partnering institutions to aim for outcomes both realistic and feasible, which reinforces the trust attitudes of individuals of the institutions. Reinforcement of trust attitudes, in turn, increases the amount of support for more ambitious collaborations, and so on. The implication of this model is that trust must be built in this manner in order to be managed properly (Vangen & Huxham, 2003).

Vangen & Huxham (2003) also describe the relationship between trust, power and control at the organizational level. They posit that often organizations interacting through

collaborations do not have an equal share of power at any one particular stage of the partnership. This results in struggles over leadership, glory-seeking behaviors, and organizations claiming sole credit for collaborative outcomes. There is also a concern that the organization with lesser overall power will lose its control to the dominant organization because of its relatively low bargaining power and dependence on the collaboration for increasing its chances for survival. Ultimately, these researchers found that in collaborations where trust was high, organizations were willing to relax their control efforts. The two frameworks presented have obvious implications for organizations that partner. However, many of the factors that influence partnerships as mentioned by Brinkerhoff (2002), Huxham (2003) and Vangen & Huxham (2003) are rooted in day-to-day interactions at the individual- and group- levels. Hence, there is value in exploring partnerships at varying levels of analysis.

Units of Analysis

As confirmed by the literature presented thus far, there are a broad range of factors that could possibly influence HBCU-PWI collaborations. Drawing from the inter-organizational partnership literature, distinctions among those factors can be made according to different levels of analysis. Analyses of different social units has been used to organize what is understood about HBCU-PWI collaborations; a good understanding of this analytical strategy is useful for planning how to approach answers to relevant research questions. An appropriate analysis of collaborations can be done at any of the following levels: individuals as individuals, individuals in social roles, social groups or teams, organizations, and inter-organizational links (Tornatzky, Eveland & Fleischer, 1990). For example, a focus on characteristics of individuals would consider the traits an individual holds for the effect they have on the success or failure of partnerships. Alternately, individuals can also be considered according to the roles, or

behaviors, attitudes and decisions they are expected to carry out in inter-organizational partnerships. For example, the importance of conducting research that relates person-level roles to outcomes is underscored by Adessa & Sonnenwald's (2003) study of HBCU-PWI research partnerships. Interviews with collaborating faculty members revealed that in one case, the partnership was deemed a failure because no one assumed the role responsible for planning the alignment of resources. These findings illustrate that ambiguity of roles can be detrimental to a project's success. In this instance, the research suggests that creating a formal role for a project manager and making that person's responsibilities explicit would have improved partnership outcomes.

Influential factors at the group-level analysis are those that affect the ability of group level goals to translate into organizational-level gain. Group-level analyses of the types of relationships discussed here would call into consideration the teams collaborating for the sake of a particular project. Research on inter-organizational partnerships done at this level of analysis identifies group-level behavior that has the potential of shaping organizational-level results. Alternately, at the organizational level of analysis, the behavior of organizations is normally the focal point. For example, all the formal motivational theories presented focus on organizational-level behaviors (Barringer & Harrison, 2000). Their behaviors are either viewed as highly rational, according to the economic perspective, or as a result of role multiplicity, according to social/organizational studies (Tornatzky et al., 1990). Finally, analyses done at the inter-organizational-linkage level allow for the consideration of inter-institutional partnership processes in relation to the structure of those alliances (Tornatzky et al., 1990). The empirical studies that are summarized in the remainder of this review are representative of research done at the individual-, group-, organizational- and inter-organizational levels of analyses.

Empirical Literature on Inter-organizational Partnerships

Inter-University Partnerships

Factors believed to affect the outcomes of scientific collaborations have been discovered in the context of inter-university collaborations. Questioning the benefits of innovation resulting from collaborations across disciplines and organizations as compared to the costs of coordination and relationship development, Cummings and Kiesler (2005) have conducted compelling research on 62 inter-organizational and inter-disciplinary partnerships. These authors sought to determine how multi-disciplinary and multi-organizational collaborations achieve successful collaborations. They hypothesized that the more disciplines and/or universities involved in a research project correlates negatively with project coordination. Cummings and Kiesler began their study by creating small focus groups with the PIs and co-PIs of 52 research collaborations under the NSF Knowledge and Distributed Intelligence (KDI) program. During three sessions, participants shared their experiences, outcomes and suggestions. Based on these contributions, Cummings and Kiesler created an on-line survey to assess coordination mechanisms and project outcomes of KDI projects. Questionnaire items included items to measure coordination, such as direct supervision of work, methods used to foster face-to-face interaction, and use of communication technologies. The survey also included items to measure project outcomes. These outcomes were categorized as 1) generation of new ideas and knowledge (i.e., Ideas) 2) generation of tools and infrastructure for research (i.e., Tools), 3) training of scientists and engineers (i.e., Training) and 4) outreach and public understanding and use of science and engineering (i.e., Outreach).

62 PIs or co-PIs of KDI collaborations responded to the survey. The major findings were that, regarding multi-organizational partnerships and coordination methods, the more

universities involved in a collaboration predicted fewer coordination mechanisms used, a lower level of direct supervision and a lower likelihood of having at least monthly project meetings. Also, in non-multidisciplinary partnerships, as the number of partnered universities increased, the more likely PIs were to work on the project during a conference or workshop. According to the data, multi-disciplinary collaborations only were associated with fewer benefits for student training. However, in projects that were both multi-disciplinary and multi-institutional, having more PI universities on a project was significantly negatively associated with the generation of innovative ideas and knowledge.

Finally, Cummings and Kiesler examined the relationship between coordination mechanisms and project outcomes. Direct supervision (used mostly by single-university partnerships) was found to be the most effective coordination mechanism for all outcome categories ($p < .10$), while face-to-face mechanisms for meetings significantly impacted student training. The generation of new ideas was predicted by travel to work with collaborators, and holding workshops and conferences to work on the project. Results of a mediation analysis supported the idea that a lack of coordination was associated with poorer outcomes in the Ideas, Training and Outreach outcome categories. Cummings and Kiesler conclude that while being a multi-institutional collaboration does not bode well for project outcomes, increased coordination mechanism could reduce these impacts. However, based on the data, PIs of multi-university projects are less likely to utilize sufficient coordination mechanisms.

Unsurprisingly, like Brinkerhoff (2002), Cumming's and Kiesler (2005) recognize partnership outcomes as the endpoint of collaboration. However, while Brinkerhoff discusses outcomes in terms of what is accomplished over and beyond what each institution could have accomplished alone, Cummings and Kiesler simply categorize different types of outcomes,

thereby focusing on the objective nature of project outcomes versus the subjective characteristics. Also embedded in Brinkerhoff's framework is Cumming and Kiesler's idea of coordination mechanisms. Brinkerhoff describes this as "degree of partnership practice", which refers to mutuality and organization identity. Recalling that requirements for mutuality include equality in decision making, resource exchange and partnership representation, one recognizes that the face-to-face coordination mechanisms that Cummings and Kiesler found to have an effect in producing specific project outcomes likely have that effect because they foster the creation of equality, resource exchange and partnership representation.

Hara, Solomon, Kim & Sonnenwald (2003) have also conducted research on inter-university scientific alliances in order to determine both group-level and individual-levels factors. In their investigation, they considered how the experiences of science collaborators are socially shaped in scientific collaboratories, which are described as "centers without walls, in which collaborators can perform their research without regard to physical location- interacting with colleagues, accessing instrumentation, sharing data and computational resources, and accessing information in digital libraries" (Wulf, 1989). The authors were especially interested in social norms of practice, the structure of knowledge and the technological infrastructure of the collaborations. The research was based on an emerging collaboratory consisting of four administratively constructed chemistry and chemical engineering research teams that were from four universities. The universities are within an hour's driving distance of each other and the collaborating teams are associated with the same scientific center; each center member was assigned to at least one of the teams (Hara et al., 2003).

Data were collected from sociometric surveys, loosely-structured interviews and observations of videoconferences and meetings. The data were submitted to a social network

analysis which exposed both the existence of different forms of collaboration and the factors that impede or facilitate collaboration according to the collaborators. During the seventh month of the center's operation, all center members were asked to complete sociometric surveys (n=54). The survey questions elicited responses about with whom the respondent interacted, how long they had been interacting, the communicating modes utilized and the content of the interactions. This was used in a visual mapping of the links among the members of the research groups. The members of one team proved to be not as tightly "linked", or as having direct collaborations with other members within their group, as the members of the other three teams (Hara et al., 2003).

These results were an impetus for further investigation into the differences between the one low-collaboration group and the other three groups. To explore the between-group differences, follow-up interviews were conducted during the ninth month of center operation among all the members of the low-collaboration group (n=13). Some members of the other three groups were also interviewed as a method of testing the validity of the interview data beyond the low-collaboration group to the other groups. Interview transcript data was analyzed; researchers identified emerging themes from comments related to the collaboration or to the context of the collaboration. This allowed for the categorization of the different types of collaboration as well as factors that seemed to facilitate or impede collaboration. Hara et al. were able to construct a general typology for all the collaborations they observed based on the forms of interaction among the collaborators. The structure of the typology suggests that collaborations exist along a continuum ranging from projects done in complementary projects, where teams have similar tasks or functions and efforts are aggregated, to fully integrated projects where each team has differentiated tasks or functions but integration among outcomes

is achieved (Chompalov & Shrum, 1999; Hara et al., 2003). The factors that were revealed to impact the collaborations are a match of interests among the collaborators, compatibility in regards to work style, writing style and priority, incentives or motivation to collaborate and socio-technical infrastructure (Hara et al., 2003).

The social network data analysis suggests that the aspects of individual-level factors that are salient to the collaboration success or failure depend on where along the continuum the collaboration resides. For instance, the significance of work interests, a feature of work connections, declines as the collaboration style becomes more integrative. Personal compatibility is considered in regards to work style, writing style and priority. All of these aspects of personal compatibility become more important the more complementary the collaboration is. However, other aspects of compatibility, such as one's personality and approach to science, are more important in integrative collaborations. Unlimited access to collaborators, a feature of socio-technical infrastructure, is more important with integrative collaboration types, while variations in awareness of others' work, in communication mechanisms, and in organizational culture and structure are more significant in more complementary collaborations. External incentives, such as funding, publications and prestige were found to be more important for complementary collaborations and internal incentives, such as opportunity to solve interesting research problems, is more important for integrative level collaborations. An alignment of work interests, skills, expertise and perspectives, a feature of work connections, was considered to weigh heavily on the success of collaborations despite the collaboration type. Because it considers the collaboration interaction level and the factors that affect collaboration, this analysis creates a framework that could be used to explain

the challenges collaborating scientists incur when they interact at a level that does not correspond with their own socially-shaped mental models (Hara et al., 2003).

The findings of this research are grounded in the part of Brinkerhoff's (2002) framework that asserts that the linkage between partnership outcomes and partner compatibility is moderated by the degree of partnership practice. In fact, Brinkerhoff lists teamwork and compatible core values as variables that contribute to success factors for partnerships. Accordingly, Hara et al.'s (2003) findings contribute by showing empirically that the impact of teamwork and value compatibility on partnership success depends on the type of partnership.

Hara et al.'s (2003) research connects individual-level factors to organizational-level outcomes by suggesting that variations in collaborator traits, such as personal motivation, work style and approach to science, are salient to partnership outcomes. Influential factors at the group-level of analysis are those that affect the ability of group-level processes to translate into organizational-level gain. In considering the partnership itself an organization of sorts, Hara et al.'s (2003) sociometric analysis of linkages among project teams revealed the saliency of group communication mechanisms to the partnerships' outcomes. Consequently, this research has identified person-level and group-level behaviors that have the potential of shaping organizational-level results.

Research and Development Collaborations

As discussed, trust building is considered one of the most important processes affecting inter-organizational relationships (Davenport et al., 1999; Vangen & Huxham, 2003). Added to the discussion is the proposition that a party external to the collaboration can promote the creation of trust (Davenport, Davies & Grimes., 1999). In one study, Davenport et al. (1999) conducted investigations at the organizational and inter-organizational linkage levels. In this

study, the R&D collaborations were formed under the premise that the relationships would foster technology transfer and knowledge acquisition. This would allow the involved firms and research institutes to integrate their existing knowledge with new information gained as a result of the collaboration. According to Davenport et al., the likelihood of “cultural clash” negatively affecting the establishment of trust, would be high naturally, due to the differences in the focuses of the organizations collaborating (e.g., academic institutions, industry), in expectations of the collaboration and in management philosophies. These differences render communication and the creation of a separate alliance management (i.e., management not originally affiliated with either partner) crucial to the collaboration. However, the authors posit that such a cultural mismatch actually presents an opportunity for exploring the ability of the third party management to facilitate the collaboration by utilizing those cultural differences to build trust (Davenport et al., 1999).

To explore this ability, Davenport et al. (1999) considered collaborations that were affiliated with the Technology for Business Growth (TBG) program, which fills the “managerial gap” for research collaborations. TBG is considered the instrument by which inter-firm linkages are supported and has rigorous criteria for the project and business plans it will accept. Heavy emphasis is placed on technological advancement and a close relationship between the industry and the research institute. The formation of trust is considered to be dependent upon social similarity; however, in light of an absence of social similarity, the TBG program allowed the dissimilar organizations to take advantage of the different abilities of each other, resulting in knowledge exchange and creation. This strategy was based on the theory that as organizations have more positive relationships with each other, not only is it more likely they will form goodwill trust, but also will this type of trust become more important than either

competence and performance or contractual trust, which are based on the expectations of ability and on adherence to agreements and practices, respectively. Based on this reasoning, the authors of this study assert that the TBG program can best promote goodwill trust by supporting repeat partnerships. TBG's success in accomplishing its goals is believed to have the effect of rendering the program unimportant in the maintenance of trust between those collaborations that have evolved to generate goodwill trust; in this respect, the collaborations will have become sustainable (Davenport et al., 1999). Davenport et al.'s exploration of collaborations under the TBG program began with the development of an interview protocol based on literature regarding R&D collaboration management. The senior level managers (n=40) of presently operating companies that had participated in the TBG program were interviewed (Davenport et al., 1999).

A qualitative analysis of interview data exposed both process and outcome variables relevant to the success of these partnerships. The data determined that thirty-nine of the forty managers interviewed considered their partnerships successful and that the definition of "success" was not always measured as technical or financial gain. The existence of relationships built and the transfer of knowledge helped to define collaboration success even when original project goals were not achieved. The interview data revealed that the top five factors for perceived collaboration success were selecting the right collaborative partner, a clear understanding of responsibilities, common goals with no hidden agendas, mutual respect and trust among partners and top managerial commitment from all parties (Davenport et al., 1999). Standing in alignment with these findings, Brinkerhoff's (2002) framework considers all five of these factors to be partnership success factors that are linked to partnership outcomes.

In Davenport et al.'s (1999) study, reasons for any problems in carrying out the project were also expressed. Though these problems apparently were overcome, managers described the sources of these difficulties as unclear or unrealistic goals, unmet expectations, a lack of trust and openness, hidden agendas, lack of commitment, lack of communication and misunderstandings. The outcomes considered relevant to the success of the TBG program were the increased number of R&D projects undertaken (90% of companies), greater employment of technical people (65% of companies), and increased R&D funding (77.5% of companies) since the companies' completion of the TBG program. Also, for 82.5% of the companies, there was a 20% increase in collaborative R&D activity from prior to participation in the TBG program. This suggests that the TBG program was instrumental in creating confidence in its management of collaborative research programs (Davenport et al., 1999).

Linking Brinkerhoff's (2002) framework with Davenport et al.'s (1999) findings on the effect of management on partnership outcomes is not a straightforward process. In order to envision the relationship between the framework and these findings, one must think of the traditional major roles managers perform: supervising faculty and staff and directing activities and resources, for instance. Following this thought, one could assume that where Brinkerhoff's framework addresses success factors and equality in partnerships, management roles are inherently factored in. It is implied as a means for addressing incompatibilities and the provision of resources and support to partners, which Brinkerhoff lists as issues relevant to trust, a success factor. In short, the framework supports the proposition that management is linked to trust among partners (Brinkerhoff, 2002). A role associated with partnership management is also assumed in Brinkerhoff's idea that partners should be satisfied that all

views are considered in relevant decision-making processes to ensure equality; according to Brinkerhoff, this is a component of degree of partnership practice.

In research that explored communication's role in research collaboration, Sonnenwald, Whitton & Maclaughlin (2003) used group-level analyses to evaluate a collaboratory system. In this instance, a nanoManipulator was used to provide shared interaction with physical samples ranging in size from DNA to single cells. The evaluation study participants were twenty pairs of upper-level undergraduate natural science students at a research extensive university who used the collaborative system. This study was conducted early in the collaboratory's life cycle and aimed to use a controlled comparison study of face-to-face and remote collaborations. The data from this study was used to understand the potential adoption and use of a collaboratory and how the collaboratory influences scientific task processes and outcomes (Sonnenwald et al., 2003).

Because of literature suggesting that working remotely would not be as conducive to communication as face-to-face interactions, Sonnenwald et al. (2003) hypothesized that the 1) study participants would be less effective collaborating remotely than collaborating face-to-face, 2) study participants would report more difficulty collaborating remotely than collaborating face-to-face and 3) study participants would report they are more likely to adopt the collaboratory system after using it face-to-face than after using it remotely. To test these hypotheses, researchers conducted a repeated-measures controlled experiment comparing working face-to-face and working remotely with the order of conditions counterbalanced. In the face-to-face condition, students shared the collaboratory system, but in the remote condition, each student had lone access to a complete system. Semi-structured interviews were analyzed to gain the perspectives of students on the difficulty of working in the two conditions.

To examine the adoption appeal of the collaboratory system, the researchers constructed, distributed and analyzed a post-questionnaire to students after they had undergone both collaboration conditions (i.e., working remotely and then face-to-face and working face-to-face and then remotely). The questionnaire examined five attributes of innovation adoption: relative advantage, compatibility, complexity, trialability and observability (Sonnenwald et al., 2003).

The quantitative analysis was based on students' lab report grades, which were considered as a task performance measure of the quality of science produced. The results of this research elucidate that it is not in all contexts that mutual knowledge needs to first be created face-to-face. In fact, working remotely before working face-to-face appeared to improve collaboration performance. A MANOVA was conducted to make within group and between group comparisons. Differences in scores for the face-to-face and remote conditions were not significant when order was not taken into account. However, when order of the conditions was considered in the analysis, there was no statistically significant difference between face-to-face and remote lab scores who collaborated face-to-face first, but there was a significant difference between the lab scores for each condition for those who collaborated remotely first ($p < 0.01$). This suggests that collaborating remotely first may have a positive effect on task performance measures in the context of scientific collaboratories (Sonnenwald et al., 2003).

Because these results are in contradiction to their original hypotheses and other literature, the researchers searched for explanations by analyzing interviews with the collaborating students. Student responses imply that collaboration productivity increased for two reasons. They report that the impersonal nature of working remotely required them to communicate more descriptively and more frequently because the need to develop a mutual knowledge base was emphasized by the situation. In other words, because of the lack of

implicit cues, students were motivated to provide more explicit cues. Also, the nature of the technology available to the students made it more advantageous to work remotely than face-to-face by allowing students to work independently on the different aspects of the same data and by improving visualization of the data. These interview responses suggest that the nature of collaborating remotely in this context increases productivity and facilitates collaborative intellectual contributions. A multivariate analysis of variance on differences in question responses due to condition revealed no statistically significant difference and only one difference (on relative advantage) due to any interaction effect between condition and order ($p < .01$). Differences in responses on relative advantage due to interaction effects were a result of participants' mean scores on this attribute always being greater after their second lab session, regardless of the order of conditions. Despite any perceived disadvantages, the students' responses to the adoptability questionnaire and to the semi-structured interviews imply that while collaborating, students developed coping strategies that were realistic enough to encourage adoption. These null results suggest that the collaboratory system does not impede collaborative scientific work. The authors conclude that there is positive potential for the development and adoption of collaboratories and for using collaboratory systems in science education as well as scientific research (Sonnenwald et al., 2003).

Though these results were not what Sonnenwald et al. (2003) originally expected, they actually support Brinkerhoff's (2002) framework. According to Brinkerhoff, the work style of these students and subsequent collaboration outcomes exemplify what she labels as "partners' willingness to adapt to meet partnership needs". This attribute is included as one of the prerequisites and success factors that influence partnership outcomes (Brinkerhoff, 2002).

Because most generalizations about multi-institutional collaborations have come from conclusions based on high-energy particle physics research collaborations, Chompalov & Shrum (1999) challenged existing ideas about the organization of collaborative projects by investigating inter-organizational collaborations (n=53) from seven specialties in physics and allied sciences. The degree to which scientific collaborations are structured bureaucratically was of specific interest; hence, this study was conducted at the organizational-level of analysis. Conclusions from this research resulted from the study's three-phases. In the first stage, collaborations in high-energy physics were of focus. Here the data collected came from 300 interviews with spokespersons, physicists, graduate students, engineers, post-doctoral fellows, computer specialists and technicians collaborating in high-energy physics research. In the second study phase, 200 interviews were conducted with academic, corporate and government scientists involved in space science, geophysics and oceanography collaborations. In the final stage, the researchers used a selective approach to conduct fewer interviews with a larger number of fields. The five fields were heavy-ion physics, ground-based astronomy, materials science, medical physics and computer-centered. A total of 23 collaborations were sampled and seventy-eight interviews were conducted with scientists in leadership and administrative roles. The interview structure for this phase was designed to reflect the interview data obtained from the first two stages and to include indicators of variable dimensions of collaboration that were common to all fields. The data submitted to factor analysis and subsequent cluster analysis are based on a sub-sample of interviews with members of collaborations (n=53) across all phases. The variables in the analysis are reflective of the features of organization and management brought out in the interviews (Chompalov et al., 1999).

An analysis of organizational structure revealed that the majority of collaborations had a designated administrative leader, a designated scientific leader, a specialized division of labor, formal contracts, outside evaluation and a well-established system of rules. The degree to which an organization was bureaucratic was based on the organization's formalization (i.e., presence of written contracts, presence of administrative leaders, division of authority, self-evaluation of the project and outside formal evaluation), hierarchy (i.e. levels of authority, system of rules and regulations, style of decision-making and degree to which leadership subgroups made decisions), scientific leadership and division of labor. The cluster analysis revealed the presence of four groups of projects: bureaucratic, leaderless, non-specialized and participatory. Bureaucratic collaborations were characterized as those with a distinct hierarchy of authority, a high number of written rules and regulations, very formalized responsibilities and specialized division of labor. Leaderless collaborations have most of its features in common with bureaucratic collaborations. The major difference for leaderless collaborations was in the hierarchy of authority; there was no single designated leader representing scientists' interests or deciding scientific issues. Alternately, non-specialized collaborations have a distinct hierarchy of authority, written rules and regulations, a specialized division of labor, but have less formalization and differentiation than do bureaucratic collaborations. Participatory collaborations represent the pole opposite bureaucratic collaborations. Teams described as participatory are characterized by the absence of the features associated with bureaucracy. In support of Chompalov et al.'s hypothesis, no one field dominated the classification groups, except in the case of the participatory group, which was composed almost exclusively of particle physics collaborations (Chompalov et al., 1999).

Chompalov et al.'s (1999) focus is on factors that Brinkerhoff's (2002) framework lists as success variables and factors characterizing the degree of partnership practice. For example, the creation and use of formal contracts and a well-established system of rules are components of success. Division of labor is a process that Brinkerhoff considers as one of the determinants of the degree of partnership practice. Thus, Brinkerhoff's framework and the results of Chompalov et al.'s study combine to make a significant contribution to inter-organizational partnership literature. The study offers a typology for and describes features of inter-organizational partnership structures; the framework suggests the relationship between variations in these structural features and partnership outcomes.

Inter-organizational Partnership Dimensions

Collectively, the research and theories presented up to this point introduce several factors that influence inter-institutional partnership outcomes. Such a broad body of factors begs organization. Thus, the author finds it useful that the literature reviewed also introduces the partnership dimensions where factors affecting partnerships can be found; this organization scheme is presented in Appendix A. The three major dimensions that have emerged in the literature are the structure of the partner relationship, the implementation processes of the partnership, and the individual- and organizational-level motivations for adopting a partnership strategy. Factors contained in the structure of the partnership include source of management, hierarchical constitution, division of labor, and contracts and agreements governing the partnership. According to the wide scope of literature reviewed, during the implementation of these relationships, variations in the levels of collaborator interaction and its appropriateness for reaching project goals, processes related to communication, knowledge and experience applied to project, planning for the project, past and present relationships amongst collaborators and

style of managements of the collaboration all have potential for impacting HBCU-PWI collaborative relationships.

Motivations for entering into partnerships are expressed at both the individual and organizational levels (Barringer and Harrison 2000; Hara et al., 2003). These motivations are related to what partners expect from each other and these expectations might be implicitly or explicitly stated, or completely unstated during any stage of the collaboration. For example, partners may have goals such as improving access to resources and markets or to improve visibility and reputation at the organizational level. Likewise, individual collaborators might seek experience and knowledge advances for themselves and their students, or prestige and publication opportunities. Thus, motivation is closely linked with satisfaction; for a member to be satisfied with the progress or outcomes partnership, the gap between project realities and expectations must be minimal.

Summary of Literature Reviewed and Study Objectives

This study's focus is on descriptors of HBCU-PWI partnerships and on the factors that affect collaborative projects between HBCUs and PWIs and between PWIs only. Though Cummings and Kiesler (2005) have described the impact of coordination mechanisms on multi-disciplinary and multi-institutional collaborative research, their research is not specific to the focal institution types. However, the results of the two qualitative investigations found on HBCU-PWI collaborations cite issues that limit optimal partnership productions. Four research partnerships have been shown to experience difficulties due to inadequate planning and due to disparities among the universities in regard and resources available for pursuing partnership activities (Adessa & Sonnenwald, 2003). Weston et al.'s (2005) research demonstrates that an educational partnership was challenged by communication, racial and cultural issues. The

outcomes of these two and only known HBCU-PWI partnership studies are based on investigations of a small number of projects. As a result, they illustrate that virtually nothing is known about HBCU-PWI partnerships.

Adding to the deficiency of information on how HBCU-PWI partnership outcomes are influenced by various processes is the difficulty in finding databases that document fundamental characteristics of these partnerships. Though a few individual universities and agencies keep some records of the inter-university partnerships that they are involved in and sponsor, there is no database maintained by any individual university that describes the details of these partnerships in terms of how funds are distributed among partners, who manages the partnership and who initiates these collaborations.

It is thus apparent that there are several unknown details regarding HBCU-PWI partnership characteristics, processes, and the saliency of their variation on partnership outcomes, such as partnership success and satisfaction with the partnership. The next task at hand, then, is to clarify exactly what has been and what has not been contributed by the empirical literature. As described, two studies have exposed a few of factors that affect HBCU-PWI partnerships. In the remaining literature reviewed, most of the variables brought out in partnership process, motivation and structural domains were discovered in non-HBCU-PWI partnership contexts; however, the situations in which they were found do bear similarities to HBCU-PWI partnerships in their structures and in their differences among the allied institutions. Consequently, all of these variables are believed to have the potential of influencing HBCU-PWI alliances, and thus, this literature does provide clues as to which factors may be salient to HBCU-PWI partnerships.

We have seen that this literature suggests that partnership results hinge on factors within three domains: motivation, process and structure. Brinkerhoff (2002) has used her framework to show theoretical linkages between these factors and partnership outcomes. However, other literature has presented other factors not explicitly included in her framework, such as the effects of power shifts during the life of the partnership effect (Davenport et al., 1999) on partnership outcomes. As a result, a host of research questions can be produced from these areas as they relate to best practices for HBCU-PWI partnerships. They refer to both the structural and more qualitative features of partnering that remain unaddressed by the extant HBCU-PWI partnership literature. For instance, do HBCU-PWI partnerships respond to the listed influential factors in the same manner suggested by the literature? Specifically, how do various partnership processes affect partnership outcomes? Do partner (e.g., organizational and personal) motivations have to match those of other members for the collaboration to be deemed successful? Do individual factors weigh more heavily on partnership success than organizational factors? How does the saliency of factors change as the partnership progresses? What infrastructure and structural characteristics of member institutions and of partnerships result in optimal partnership outcomes?

Owing to space and time constraints, this study will venture to satisfy five major goals. One of the primary drivers of this research is that there are no published descriptors available for HBCU-PWI partnerships among universities. As a result, the first goal will be to describe the nature of HBCU-PWI partnerships in terms of how many exist, which universities collaborate, the sizes of the collaborating universities, which departments of those institutions form partnerships, the initiating partner, the level of funding, and the distribution of funds among partners.

Several assertions put forth by the extant literature combine to form the impetus for three goals of this research. Of the inter-organizational partnership motivating theories reviewed by Barringer & Harrison (2000), all are potential driving forces for the adoption of an inter-university partnership strategy. However, the literature does not show if institutions such as PWIs and HBCUs entering into these partnerships have different reasons for doing so. Additionally, the literature suggests that HBCUs and PWIs have disparate levels of resources that affect partnerships (Adessa & Sonnenwald, 2003; Rawls, 1991). However, the extent of these differences is not well documented in the literature. Finally, authors suggest there are differences in how various partnership processes are perceived (Adessa & Sonnenwald, 2003; Weston et al., 2005). Again, the literature does not illustrate the degree to which these perceptions differ.

As is apparent, there are factors that are discrepant at both the university and partnership levels. Thus, two study goals are to understand university-level factors that affect partnerships. Specifically, one goal (i.e., study goal 2) will be to compare HBCUs and PWIs who are involved in the HBCU-PWI partnerships. Experience suggests that PWI PIs who choose to enter into HBCU-PWI partnerships differ from PWI PIs that are involved in PWI-PWI partnership arrangements. However, there has been no literature found to remark on this hypothesis. Therefore, the third goal of this study is to compare the experiences and perspectives of PWI PIs that are involved in HBCU-PWI partnerships with PWI PIs that are engaged in PWI-PWI partnerships. As with the second goal of this study, the focus will be on the processes, structure and motivation of these PIs and their home institutions. Due to potential partnership-level differences, the fourth goal focuses on differences in factors in HBCU-PWI partnerships versus PWI-PWI partnerships.

The final goal of this study will be to explore the relationship between HBCU-PWI partnership factors and partnership outcomes. The factors explored for a significant relationship with outcomes will be based on literature and experience. Furthermore, a sub-goal of the study will be to determine if the type of the institution that the PI represents has any effect on partnership outcomes.

Methodology

Objectives

The objectives of the study were:

- 1) To describe HBCU-PWI partnerships according to their structural and procedural characteristics.
- 2) To compare HBCUs and PWIs involved in HBCU-PWI with PWIs involved in PWI-PWI partnerships on motivational, structural and partnership-related process variables.
- 3) To predict partnership outcomes.

Research Questions

- a. What are the structural and procedural characteristics of HBCU-PWI and PWI-PWI partnerships, including:
 - i. Structural
 1. Partnership goals
 2. The focus of partnerships (i.e., research, educational or research and educational)
 3. Number of universities involved in partnership
 4. Physical distance between partner universities
 5. The allocation of funding amongst institutional partners
 6. Institutional leader of partnerships
 7. Faculty and student involvement
 8. PI characteristics

ii. Procedural

1. Aspects of planning (e.g., initiation, communication, goal-setting, etc.)
2. Aspects of operating partnership (e.g., communication among universities, degree of collaboration)
3. PI perceptions of factors at each stage that were facilitators or barriers for HBCU-PWI partnerships

iii. Outcomes

1. PI perceptions of project success
2. PI satisfaction with partnership processes and project outcomes
3. Achievement of university-level goals

b. How similar or different are HBCUs and PWIs that participate in HBCU-PWI partnerships and PWIs that participate in PWI-PWI partnerships in the following areas:

i. Structural

1. Goals of their partnerships
2. The focus of partnerships (i.e., research, educational or research and educational)
3. Number of universities involved in their partnerships
4. Physical distance between their university and the university with which they were most involved
5. The amount of funding received
6. Status as institutional leader
7. Number of faculty and students involved in the partnership

8. Extent of acquaintance with partner faculty before partnering
- ii. Procedural
 1. Allocation of university resources
 2. Aspects of planning (e.g. motivations for partnering, project initiation, communication within each university)
 3. Aspects of operating partnership (e.g., project implementation, communication within each university, degree of collaboration)
 4. Respondent's level of involvement in partnership decisions at the planning and operational partnership stages
 5. PI perceptions of factors at each stage that were facilitators or barriers for HBCU-PWI partnerships
 - iii. Outcomes
 1. PI satisfaction with partnership processes and project outcomes (including willingness to partner again)
 2. PI perceptions of project success
 3. Achievement of university-level goals
- c. What are the variables that predict partnership outcomes, including:
 - i. Perceptions of project success
 - ii. Satisfaction with partnership outcomes
 - iii. Satisfaction with partnership processes
 - iv. Achievement of university level goals
 - v. Possible moderation of partnership type and type of institution represented by respondent PI

Research Design

This study is a cross-sectional assessment of HBCU-PWI and PWI-PWI partnerships. In addition to descriptive analyses of HBCU-PWI collaborations, data were used to compare the HBCU and the PWI sides of HBCU-PWI partnerships and the PWI side of both HBCU-PWI and PWI-PWI partnerships.

To address the objectives of this study, both quantitative and qualitative data collection methods were utilized. Descriptive analyses answer the first listed research objective while comparative analyses answer research questions related to the second numbered objective. The research questions addressed aspects of partnering at the individual-level, organizational-level (i.e., academic institution) and inter-organizational level (i.e., partnership processes and factors); accordingly, outcomes resulting from this part of the investigation were performed at each of these levels. Predictive analyses were used to address research questions related to the third objective. Answers to these questions are based on the relationships of partnership outcome measures to partnership factors also at the organizational, individual and inter-organizational levels.

The methodology for this study is based on a model that conceptualizes inter-university partnerships as having two stages (Figure 2). The first stage, the planning stage begins when the project idea is conceived and concludes when grant money is received. Activities that occur during the planning stage include extending invitations to other institutions to become partners and the writing and submission of proposals. The second stage, the operational stage begins when project-specific activities begin and ends when the project activities conclude.

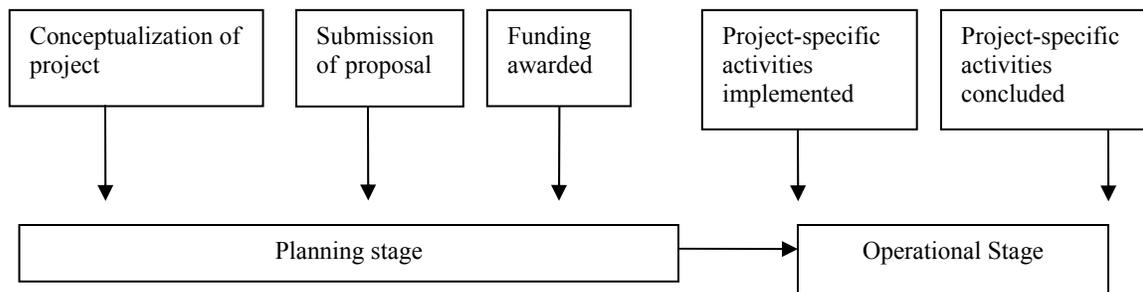


Figure 2. Conceptual model of inter-university partnership stages.

Partnership Selection

HBCU-PWI and PWI-PWI partnerships examined in this research were found in one of the databases that list externally-funded university research partnerships. The first database of sponsored research was maintained by the administrators of a 16-university system in a southern region. However, this database was very incomplete; thus, additional databases were also used to create a representative list of partnerships in the university system. The second, third and fourth databases listing sponsored research are each maintained by specific research universities that are a part of the aforementioned university system. These databases only list the collaborations specific to their respective universities. Information listed in the three databases included the title, abstract, departmental affiliation (within the lead university), university partner, PI and co-PI, project start and end dates and funding amount of each collaboration project.

In order to promote as much homogeneity across the sampled HBCU-PWI collaborations, the following selection criteria were used: a) involved at least one HBCU that has either a large number of master's degrees produced or a high degree of research activity; b) involved at least one PWI that has either a high or very high degree of research activity; c) conducted research in one of the STEM disciplines; d) had been in operation for at least six

months at the time of data collection; and e) was either still in operation or had not concluded more than 12 months earlier at the time of data collection. In order to get an adequate sampling of HBCU-PWI partnerships, an effort was made to contact all PIs of such partnerships that were listed in all the databases.

PWI-PWI partnerships were selected from partnerships listed in the three PWI university databases. Sub-lists were created that included only PWI-PWI partnerships that fit criteria “b”-“e” listed above. PWI #1 had over 100 partnerships that seemed to fit these criteria; Thus, PIs were sampled allowing random sampling with replacements. However, an attempt was made to contact all PIs of partnerships from databases of PWI #2 and PWI #3, since they were fewer in number. It is important to note that no attempt was made to sample PIs who were collaborating with each other (i.e., dyads).

Participants

A total of 29 partnerships were sampled for this study. Those collaborations, HBCU-PWI partnerships (n=19) and PWI-PWI (n=10) partnerships, were investigated by interviewing partnership PIs who were faculty at HBCUs and partnership PIs who were faculty at PWIs. For convenience, henceforth, principle investigators (PIs) who are affiliated with HBCUs and involved in HBCU-PWI partnerships will be referred to as “HBCU PIs”. PIs who are affiliated with PWIs and involved in HBCU-PWI partnerships will be referred to as “PWI PIs”. Those PIs who are affiliated with PWIs and involved in PWI-PWI partnerships will be referred to as “PWI2s”.

Two of the interviewed HBCU PIs and one PWI PI, were unable to provide sufficient data for a complete analysis. Thus, the analyses presented are based on data from 26

partnership PIs. Table 1 lists the numbers of partnerships available at each stage of the selection process.

Table 1.

Partnerships Available for Sampling

	HBCU	PWI	PWI2s
Total number of partnerships initially appearing to be appropriate, per titles and abstracts*	20	20	123
Number direct contact achieved	13	16	15
Number willing to be interviewed	13	11	14
Number passing screening interview (i.e., total number actually fitting criteria)	10	9	10
Total number completing entire interview	10	9	10
Number of PIs providing sufficient data	8	8	10

*when available

Data Collection Procedure

Data Collection

In addition to the four databases utilized in the selection of the partnerships, there were two additional sources of data: websites that provide basic data about the partnered universities and the author-constructed structured interview. In order to collect data that addresses all the research goals, both quantitative and qualitative data collection methods were used. University and Carnegie Classification of Institutions of Higher Education websites were used to provide descriptive data regarding the partnered universities (e.g., demographics, campus location, and university classifications) (<http://www.carnegiefoundation.org/classifications/>) and to gather partnership-level data (e.g., funding source, names of partnership PIs) from the sponsored

research databases. Structured interviews were used to gather information from PIs about partnership structure and process.

The PIs of partnerships that were selected from the sub-lists of partnerships fitting the study criteria were first contacted by e-mail. This initial e-mail included a letter from a university-system administrator of research and sponsored programs (Appendix B) that both introduced the study and invited the PI to participate. Follow-up calls were made to each PI within a week of the sending of the initial e-mail. It was necessary to confirm and add to the information listed in the sponsored research databases before scheduling interviews with each PI. Consequently, during the follow-up phone calls, three screening questions were asked to confirm information provided in the database and to provide new information about the PI (Appendix C). The PIs were asked a) if they indeed were involved in the partnership listed in the database, b) if they were the person most familiar with the development of the project and its day-to-day operations, and c) if the project was more than 6 months old. A negative response to the first and second questions required follow-up questions that were meant to guide the interviewer to the correct PI for interviewing. If the respondent answered that the project was less than 6 months old, then data was not collected on the partnership or the PI.

Following a PI's expressed willingness to participate in the study, the interview was scheduled. A second e-mail was sent within 48 hours that listed the date and time of the scheduled interview and contained an informed consent form (Appendix D) and a PowerPoint file (Appendix E) of the items that were to be asked during the phone interview (i.e., items as listed in the interview protocol). At the time of the scheduled interview, the PI was called and asked to give verbal consent to participate in the study (based on the information presented in the informed consent form previously sent by e-mail). Before obtaining this consent, the

interviewer re-iterated the desire to audio-record the phone call facilitating the documentation of responses to open-ended items. One hundred percent of the PIs consented to the audio-recording of the conversation; two of the participants wished to be interviewed in person and still allowed the recording of the interview. After consent was obtained, the interviews proceeded in accordance with the interview protocol.

Research Constructs

Partnership Structural Characteristics

Collaboration literature presents sophisticated typologies for describing inter-organizational partnerships based on the kinds of collaborator linkages (Hara et al., 2003) and organizational structure (Chompalov et al., 2000). Currently, the literature does not provide any descriptors of HBCU-PWI partnerships that could provide groundwork for such typologies. Thus, this study contributes to the literature by examining basic characteristics of the selected partnerships and involved universities, such as project goals, the number of universities involved in partnership, the allocation of funding and faculty and student involvement.

Partnership Procedural Characteristics

Several collaboration literature authors have suggested that partnering organizations are potentially different on a number of motivational and process factors related to partnerships. These factors fall within the following domains: 1) initiation and motivation for partnering; 2) resources; 3) involvement and roles; 4) planning and implementation; 5) communication; 6) characterization of partnerships (i.e., power differentials, degree of collaboration and partner performance); and 7) facilitators and barriers (Adessa & Sonnenwald, 2003; Barringer & Harrison, 2000; Cramton, 2002; Davenport et al., 1999; Weston & McMillan, 2004).

Initiation and motivation for partnering. The literature presents theories suggesting why and how partner relationships form (Barringer & Harrison, 2000; Donaldson & Preston, 1995; Osborn & Hagedoorn, 1997). However, there has been no research to examine individual-level motivations for entering into HBCU-PWI and PWI-PWI partnerships. Also, though the literature explains why and how decisions to partner are made at the organizational level (Barringer & Harrison, 2000; Donaldson & Preston, 1995; Osborn & Hagedoorn, 1997), there is no research on how and why HBCUs and PWIs agree to inter-university partnerships. The current study addresses this gap in the literature by exploring the reasons PIs representing HBCUs and those representing PWIs decided to partner with each other as well as their perceptions of why their universities supported the collaboration.

Resources. Because many of the resources needed for inter-university partnering exist within each institution (Adessa & Sonnenwald, 2003; Weston & McMillan, 2004), each partner university is faced with having to designate resources to the partnership. In the literature, the specific resources that faculty members indicate are relevant for inter-university partnerships include amount of time available to devote to partnership-related activities, amount of human resources, and amount of infrastructure support. The literature shows that these resources can be disparate among HBCUs and PWIs and that these discrepancies are related to the perceived success of the project (Adessa & Sonnenwald, 2003). In order to better understand availability of resources as a partnership concern, this study seeks to determine the degree to which the institutions provide resources for PI partnership involvement.

Involvement and roles. The level of a partnership participant's involvement in decision-making is theorized to be salient for understanding how power is shared among partners (Brinkerhoff, 2002; Huxham, 2000). Furthermore, Huxham asserts that power shifts occur as

collaborations develop; this suggests that involvement in partnerships may also shift at different stages. Thus, the current study has sought to understand the level of involvement of respondents in making decisions for their partnerships at both the planning and operational stages. It also has sought to determine the number of formal roles each respondent had during the course of the partnership.

Planning and implementation activities. Adessa & Sonnenwald (2003) found that the activities that occur during the start-up phases of partnerships are salient to the progression of those partnerships. Activities include the creation of partnership goals, planning for the implementation of the project and actually carrying out the project. The current study has sought to better understand each partnership in regards to these activities.

Communication. Literature on inter-organizational processes emphasizes the role of communication among collaborators (Cramton, 2002; Hara et al., 2003; Sonnenwald et al., 2002). For example, Adessa & Sonnenwald's (2003) findings suggest that communication during partnership planning stages can serve to clarify the abilities and needs of each partner university. Cramton (2002) further remarks on the saliency of communication in relationships; she comments that distally located partners face the challenges of overcoming the distrust issues that modern telecommunication abilities foster. Additionally, the literature suggests that communication frequency and mode depend on organizational culture (Cramton, 2002). Thus, this study has examined communication between partner universities as well as communication within partner universities among partnership-involved faculty.

Partnership Characterization. Based on experience and the literature, perceptions of partnerships among academic institutions vary on several factors. Hara et al (2003) noted a difference in the degree to which partnership members actually work together. Thus, this study

has sought to determine perceptions of the extent of collaboration between faculty members of partnered universities.

The existence of power differentials among partnered institutions also has been suggested in anecdotal accounts of HBCU-PWI partnerships (Federal Demonstration Partnership, 2003). Perceptions of power imbalances might be manifested in the seemingly systematic and unequal or disrespectful treatment of partnership participants or in the perceived unfair allocation of partnership funds among partner institutions. Accordingly, this study has examined such perceptions.

One aspect of *roles*, the ability of individuals and institutions to perform as expected or agreed, affects the building of trust (Vangen & Huxham, 2003; Davenport et al., 1999). Brinkerhoff's (2002) framework indicates that perceptions of a partner's ability to perform her roles affect the outcomes of partnerships by influencing mutuality, organization identity, and partner satisfaction with the partnership. Thus, this study has examined respondents' perceptions of partner faculty and administration performance.

Facilitators and barriers. The literature indicates that trust building, power wielding, partnership management, previous knowledge of collaborating members, personal and organizational similarities and differences are broad sources of influence on partnership processes (Brinkerhoff, 2002; Davenport et al., 1999; Hara et al., 2003; Vangen & Huxham, 2003). However, the factors that positively or negatively influence HBCU-PWI and PWI-PWI partnership arrangements are poorly understood. Data from a small number of partnerships show that different partners make discrepant observations about difficulties encountered in HBCU-PWI partnerships (Adessa & Sonnenwald, 2003; Weston & McMillan, 2004). In order

to complement the extant literature, this study has documented the facilitators and barriers partnership PIs have experienced during the life of their partnerships.

Partnership Outcomes

In addition to other gaps, the literature has not commented on differences among HBCU-PWI and PWI-PWI partnerships. In order to make partnership-level comparisons, the following outcomes were assessed in the present study: 1) satisfaction; 2) perceptions of project success; and 3) goal achievement. Each of these variable domains is described in the text that follows.

Satisfaction. Satisfaction can be examined with respect to both partnership processes and project outcomes. Specific partnership processes that are indicated in the literature include equality in decision-making (Brinkerhoff, 2002), communication (Cramton, 2002), and resource alignment (Adessa & Sonnenwald 2003). Rationally, faculty level of satisfaction with the ability of the partnership to achieve both stated and unstated goals is a significant outcome for the focal HBCU-PWI and PWI-PWI partnerships and impacts the likelihood of potential partnerships between these groups. As a result, this study has sought to better understand levels of participant satisfaction with partnership processes and project results.

Perceptions of project success. The literature describes several factors that affect partnership outcomes, including perceptions of project success and satisfaction with the partnership (Brinkerhoff, 2002; Davenport et al., 1999; Hara et al., 2003; Sonnenwald et al., 2002). Brinkerhoff (2002) suggests that the belief that the partnership has yielded more than one partner would have accomplished alone heavily influences perceptions of success. Other research has shown that, contrary to traditional thought, success is not always measured in financial or technical gain (Davenport et al., 1999). Often, the attainment of project goals

defines success; however, the perception of what the project goals are varies among partnerships and may differ from collaborator to collaborator within any one partnership (Brinkerhoff, 2002). Instead of assigning meaning to *project success*, this study examines success by taking the same approach recommended by Brinkerhoff (2002), allowing the respondent to rate project success based on their own definitions and experiences.

Goal achievement. Goal achievement, as it is related to motivations for partnering, is important at the personal, institutional and partnership levels (Barringer & Harrison, 2000; Brinkerhoff, 2002). This study has sought to understand the degree to which partnerships achieve the aims of the individuals participating in the partnership as well as the universities involved in the partnerships.

Instrument Development and Procedure

Many considerations had to be taken into account in designing the data collection instrument. For instance, several items on the instrument created contingencies; the length of the instrument suggested an interview might produce better response rate; some questions involved a number of complicated forced choice options; the open-ended items had the potential of adding richness to the quantitative data. These circumstances reasonably suggested both survey and interview methodologies. In order to obtain the benefits of both methods, a third option was taken: the design of a highly structured interview that would facilitate both forced choice responses and open-ended responses. Respondents were given a powerpoint version of the interview items so they could follow along with the questions and response choices. The instrument was piloted with two PIs involved in inter-university partnership. This led to the re-arrangement of items and an enhanced interview protocol that would allow for

better collection of the desired information (Appendix F). Based on mock interviews done with this final form of the interview protocol, interviews could be completed in 30 minutes.

Many of the items asked during the interview elicited responses from the PIs regarding their relationships with the university partner administration and PI. Because of the possibility that any one partnership might involve several university partners, and the author's need to gather information about both HBCU-PWI and PWI-PWI partnerships, the interview protocol was designed to obtain information about a single partner. Thus, when a PWI PI was involved in a selected partnership that had both PWI and HBCU partners, the PWI PI was asked to respond to the questionnaire according to her relationship with the HBCU partner. In the event there was more than one HBCU partner, the relationship with the HBCU partner with the highest research activity was the focus of the interview. Likewise, when HBCU partners acknowledged there were several PWI research university partners involved in the collaboration, they were asked to respond to interview items based on their relationship with the faculty of the highest research-active partner institution with whom they had the most interaction. PWI2s were asked to respond to interview items based on their relationships with the faculty of the highest research-active partner institution with whom they had the most interaction.

Items on the interview instrument ask for objective and subjective responses regarding factors and processes that occur in inter-university partnerships. The instrument is comprised of five sections. The first section, asks for basic information about the partnerships and the partner universities, such as the focus of the partnership project, funding, student involvement, the number and types of universities represented in the partnerships and the number of participating faculty from each university. In keeping with the partnership model depicting two

partnership stages, the second and third sections of the interview protocol, “Project Planning” and “Project Operation”, were dedicated to items focused on factors, processes and satisfaction with these factors and processes during each of the partnerships’ two stages. The fourth section of the interview protocol, “Overall Evaluation” contains items that ask the respondent to reflect on partnership goals, perceptions of project success and satisfaction with the partnership. The final protocol section asks respondents demographic information about them, including ethnicity and faculty rank. The bases for exploring specific partnership aspects are discussed in the following section.

Measures

Partnership Structural Characteristics

Project goals. Qualitative data regarding the goals of each partnership project was collected by asking each respondent, “*Could you briefly describe for me the nature and the goals of the project?*” Responses to this item were open-ended (Appendix F: item 1).

Level of importance given to project goals. In order to assess the level of importance common aspects of projects held, respondents were asked, “*How important were the following to your research project?*” The importance of specific aspects (research and/or knowledge creation; research training of undergraduate and graduate students; the development of curriculum, the research training or education of underrepresented groups; other) was rated according to a likert-type scale where 1= “not at all important” and 5= “very important” (Appendix F: item 2).

Number of involved universities. The number of formally participating universities was determined based on participant responses to the item, “*What other universities received funding for this partnership?*” (Appendix F: item 3).

Physical distance between the most collaborative universities. In the cases of multiple university partnerships, the interview protocol required each participant to identify the highest research-active university partner with whom she most often collaborated. In order to determine the physical distance between each respondent's university and the identified partner university, driving distances were calculated using on-line digital directory (<http://www.mapquest.com/directions/>).

Allocation of funding. To determine the proportion of funding partnering universities received, each respondent was asked to report the percentage of funding received by their university and received by up to three of the partner universities that received the largest proportions of the funding (Appendix F: item 4).

Institutional leader of partnerships. Respondents were asked, "Which institution was considered the "lead" institution?" (Appendix F: item 5). The identified institution's research-activity status was then determined according to the Carnegie Classification System (<http://www.carnegiefoundation.org/classifications/>). Partner institutions were classified as Master's Large Institutions, Doctoral Research Institutions, Research Universities with High Research Activity and Research Universities with Very High Research Activity. For the current research, the level of research activity is treated as a dichotomous categorical variable. Thus, for each level of research activity, universities were coded as "0" to indicate the institution did not fall into the category or "1" to indicate it did fall into the category.

Number of faculty involved in partnership. Basic faculty member participation was assessed by asking the respondents "Approximately how many faculty members were involved in the project at each institution?" (Appendix F: item 6) Respondents were asked to identify

the numbers of faculty at their institutions as well as up to three of the institutions that received the highest percentage of the project funding (i.e., the same institutions listed in item 4).

Number of students involved in partnership. Respondents were asked to report the total number of students that were involved in the project from all partner universities during the most current grant year (Appendix F: item 7). They were also asked to report the total number of students involved in the project from their respective universities during the most current grant year (Appendix F: item 8).

Respondent characteristics. Demographic information about the study participants was also collected. Responses to the item regarding gender (Appendix F: item 44) were coded either “0” to indicate the participant was a male or “1” to indicate the participant was a female.

Faculty rank was asked in a forced-choice item that asked participants to specify their faculty rank (Appendix F: item 45). Responses (assistant professor; associate professor; full professor; other) were coded as “0” to indicate the participant did not hold the specified rank or as “1” to indicate the participant did hold the specified rank.

Items regarding being tenured (Appendix F: item 46) or in a tenure-track position (Appendix F; items 47), were dichotomously coded, such that a code of “0” indicated the participant did not have that characteristic and a code of “1” indicated the participant did have that characteristic.

Determination of respondent departmental affiliation was determined based on responses to an open ended-item (Appendix F: item 48).

Having an administrative role (Appendix F: item 49) and having citizenship in the United States (Appendix F: item 50) were dichotomously coded, such that a code of “0”

indicated the participant did not have that characteristic and a code of “1” indicated the participant did have that characteristic.

Finally, respondents were asked to identify their ethnicity (Appendix F: item 51). The mostly likely responses were listed (Black; White; Asian-American; Hispanic-American; American Indian/Alaskan Native). Responses were coded as “0”, indicating a participant did not identify with the ethnic group or as “1”, indicating the participant did identify with the ethnic group. Participants were also encouraged to name the ethnic group with which they most identified if it was not listed.

Partnership Procedural Characteristics

Initiation and motivation for partnering. Data on partnership initiation and personal motivations for adopting an inter-university partnership strategy comes from responses to two interview items. One item, asks the respondent, “*Who first conceived of this partnership-based project?*” (Appendix F: item 11). This forced-choice item includes several responses (i.e., it was my idea; faculty at my university; faculty at a partner university; it was a joint idea between me and the other partner PI(s); an administrator at a partner university; an administrator at my university; it was a joint idea between administrators at my and another partner university; I don’t know; other). Responses were coded “0” to indicate a party’s lack of responsibility for project conception or “1” to indicate the responsible party for project conception.

The second item is also forced choice and asks the respondent, “*Why did you decide to participate in this partnership?*” According to participant responses, each option for this item (e.g., it was my idea, I was assigned to do it by an administrator, I was asked to do it by an administrator at my university and I accepted, I was asked to do it by a colleague at my

university and I accepted, I was asked to do it by a colleague at a partner university and I accepted; other) was coded “0” to indicate it was not the basis for the respondent’s decision to participate or “1” to indicate it was the basis for the respondent’s decision to participate (Appendix F: item 12).

In order to better understand university-level reasons for partnering the interview includes an open-ended item that asks the respondent, “*In your opinion, what motivate your university to support a partnership instead of pursuing the project alone?*” (Appendix F: item 14).

Resources. To understand the allocation of university resources, one set of items ask PIs, “*To what extent did your institution make the following arrangements for you to work on this project?*” Listed arrangements included (i.e., reduction in course load; increased technology to support my university’s contribution to the project; increased administrative assistance; funding for partnership project-related travel; release time; other). Responses were based on a five-point likert scale where 1= “not applicable” and 5= “a very large extent” (Appendix F: items 13a-e). Participants were also given the option to express that the resource was not applicable to their situations.

An attempt was made to determine if the university resource items constituted a scale that could be used in further analyses. An exploratory principle components factor analysis determined the items constituted one factor. “Funding for partnership project related-travel” (item 13d) was removed from the factor because it reduced the factor’s reliability. The resulting four-item factor (items 13a-b, c & e) explained 73.36% of the variance in the university resources for respondents to participate in the project (see Table 2). The each

respondent's scores for the four items were averaged for the university resources measure (Cronbach's Alpha = .88). The measure's scale mean was 1.78 (S.D. =1.08).

Table 2.

Exploratory Factor Analysis Results for University Resources

Item	Factor Loading	
	1	Communality
Reduction in my course load	0.93	0.86
Increased technology to support my university's contribution to project	0.78	0.61
Increased administrative assistance	0.82	0.68
Release Time	0.89	0.79
Eigenvalue	2.93	Total Variance
Variance Explained		73.36%

Involvement and roles. In order to better understand how the level of involvement varies among partners during the progression of HBCU-PWI and PWI-PWI partnerships, the interview protocol contains two items, both of which ask “*To what extent did you contribute to decisions made during the following activities?*” The first of these items lists activities during the planning stage (e.g., writing the proposal for the project), while the second lists activities performed during the operational stages (e.g., managing the overall project). Both sets of items were rated on a five point likert scale where 1= “no extent” to 5= “a very large extent”. Both items and the full scale are presented in the Appendix as items 18 and 27.

An exploratory principle components factor analysis was conducted to determine if the decisions during planning items constituted a scale that could be used in further analyses. All four of the items (items 18a-d) explained 83.95% of the variance in the extent of the respondents' planning decision making (see Table 3). Each respondent's scores for the four

items were averaged for the planning decision making measure (Cronbach's Alpha = .93). The measure's scale mean was 3.92 (S.D. =1.08).

Table 3.

Exploratory Factor Analysis Results for Planning Decision Making

Item	Factor	Communality
	Loading	
Conceptualizing the project	0.70	0.84
Formulation of project goals	0.90	0.95
Writing the proposal for the project	0.83	0.91
Planning for the implementation of the project	0.93	0.96
Eigenvalue	3.36	Total Variance
Variance Explained		83.95%

An attempt also was made to determine if the items regarding decisions made during the operational stage constituted a scale that could be used in further analyses. An exploratory principle components factor analysis determined that several of the items constituted one factor. "Managing the overall project" (item 27a) was removed from the factor because it reduced the factor's reliability. The six-item factor (items 27b-g) explained 52.95% of the variance in the extent of the respondents' operational decision making (see Table 4). Each respondent's total score for the six items was calculated and averaged for the operational decision making measure (Cronbach's Alpha = .81). The measure's scale mean was 3.72 (S.D. =.91).

Table 4.

Exploratory Factor Analysis Results for Operational Decision Making

Item	Factor Loading	Communality
	1	
Managing the project on your campus	0.62	0.38
Carrying out the project's main activities	0.86	0.73
Writing of publications and reports	0.82	0.67
Supervising graduate student research	0.68	0.47
Supervising or teaching undergraduates	0.68	0.46
Providing extension assistance	0.69	0.47
Eigenvalue	3.18	Total Variance
Variance Explained		52.95%

Additionally, the interview protocol contains a set of items that asks each respondent which formal roles they have fulfilled for the partnership. This set of items is presented in Appendix F as item 16. Responses to this item were coded “0” to indicate that the participant did not fulfill the role or “1” to indicate that the participant did fulfill the role.

Planning and Implementation. In order to better understand planning and implementation activities, the interview elicits responses to several items. Two items in the interview protocol focus on the formation of project goals. The first item is open-ended and asks the respondent to explain the process used for developing project goals (Appendix F: item 17). A second item asks respondents, “*After the proposal was approved, how much time was spent planning for the actual implementation of the project?*” (Appendix F: item 24). Responses were rated on a five-point scale where 1= “almost none” and 5= “a week or more”.

Respondents were asked to give the details of what was done to plan for project implementation in an open-ended item (Appendix F: item 25)

In regards to the actual carrying-out of the project, an open-ended item asks participants to describe the major activities that were carried out during the operational stage of the project (Appendix F: item 26).

Communication. This study seeks to determine the frequency of intra-university communication among those collaborating in HBCU-PWI and PWI-PWI partnerships, as well as the frequency and modes of *inter*-university communication among partnership participants within each HBCU and PWI. To this end, respondents were asked to respond to four items about the frequency of inter-university communication during the planning (Appendix F: items 20 & 21) and operational stages (Appendix: items 28 & 29). There were also four items that ask the frequency of intra-university communication during the planning (Appendix F: items 22 & 23) and operational stages (Appendix F: items 30 & 31). Responses to items 20 and 22 were simply the number of times the face-to-face communication occurred during the planning stage. Frequency scales for items 21, 23 and 28-31 range from 1= “once” to 5 = “almost daily”. Question 32 asks the respondent the location of face-to-face inter-university meetings. Possible responses include “on my university’s campus”, “at the campus (of one) of the other partner university(s)”, “at a neutral meeting place, meaning at neither partner university’s campus”, the location for pre-planning meetings altered among the partner universities”, and “we never met face-to-face.”

Partnership Characterization. All respondents were asked to respond to agree or disagree to a set of statements regarding their perceptions of their partnership. Responses to each of the following items were rated on a five-point likert scale, where 1= “strongly disagree”

and 5= “strongly agree”. Participants were also given the option to express that the resource was not applicable to conditions of their partnerships.

To better understand how much collaboration takes place in these partnerships, an item asks respondents to agree or disagree to the statement, “*This partnership has been characterized by a close working relationship with faculty members from the partner university*” (Appendix F: item 35a).

Respondent perceptions of the balance of power between the respondent’s university and the university with which they most collaborated were collected from responses to the statement, “*This partnership has been characterized by a balance of power between my and the partner university*” (Appendix F: item 35b).

In order to assess perceived adequacy of partner role performance, the interview protocol contains two relevant items. One asks the respondent to agree or disagree to the following statement: “*This partnership has been characterized by capable administrators at the partner university*” (Appendix F: item 35c). A second item asks the respondent to agree or disagree to the following statement: “*This partnership has been characterized by competent faculty members from the partner university*” (Appendix F: item 35d).

The interview protocol also contains an additional item that pertains to understand the perceived fairness of partnership resources to partner universities, which presents respondents with a statement, “*This partnership was/has been characterized by fair allocation of funding to my university for my participation in this project*” (Appendix F: item 35e).

An exploratory principle components factor analysis was conducted to determine if the partnership characterization items constituted a scale that could be used in further analyses. The analysis determined that these items constituted two factors. “*This partnership has been*

characterized by a close working relationship with faculty members from the partner university” (item 35a) was removed from the analysis because it did not load highly onto any factor. Together, the remaining four items explained 63.05% of the total variance in partnership characteristics. The first factor, created the sub-scale *partner equality*, which consisted of two items (items 35 b & 35e) that explained 39.23% of the variance in partner equality (see Table 5). Respondents’ scores for the two items were totaled and averaged for the partner equality measure (Cronbach’s Alpha = .83). The measure’s scale mean was 4.31 (S.D. =.88).

The second factor, created the sub-scale *partner capability*, which consisted of two items (items 35 c-d) that explained 23.82% of the variance in partner capability (see Table 5). Each respondent’s scores on the two items were totaled and averaged for the partner capability measure (Cronbach’s Alpha = .49). The measure’s scale mean was 4.52 (S.D. =.63).

Table 5.

Exploratory Factor Analysis Results for Partner Perceptions

Item	Factor Loading		Communality
	Partner Equality	Partner Capability	
A balance of power between my university and the partner university	0.91	0.12	0.83
Fair allocation of funding to my university for my participation in the project	0.93	0.04	0.72
Capable administrators at the partner university	.052	0.85	0.64
Competent faculty members from the partner university	0.21	0.77	0.87
Eigenvalue	1.96	1.19	
Variance Explained	39.23%	23.82%	Total Variance
Total Variance Explained			63.05%

Facilitators and barriers. This study further examines the perceptions of PIs involved in HBCU-PWI and PWI-PWI partnerships in regards to which factors were facilitators or barriers for these relationships. Because a previous association between the partner faculty members is believed to be a facilitator, one item asks “To what extent did you know the faculty involved in the project from the partner university before the project was conceived?” Responses to this item are based on a five-point likert-type scale where 1= “no extent” and 5= “a very large extent”. (Appendix F: item 33). Also included in the interview protocol were two open ended items that ask the respondent to comment on any partnership obstacles and facilitators that were encountered during the life of the partnership (Appendix F: items 39 & 40).

Partnership Outcomes

Satisfaction. In order to assess these perceptions of project perceptions, the interview includes one item that asks respondents to rate their satisfaction with the outcomes of their respective projects. Responses to this item were rated on a five-point likert scale, where 1= “not at all satisfied” and 5= “very satisfied” (Appendix F: item 43).

Multiple items assessed respondents’ satisfaction with these partnership factors. Responses to all satisfaction items that are explained here were rated on a five-point likert scale where 1= “very dissatisfied” and 5= “very satisfied”.

Respondents were asked to rate their satisfaction with partnership activities during the planning and operational stages. One item assesses satisfaction with “activities related to the development of project goals” (Appendix F: item 34a). In order to connect levels of involvement with possible power differentials, the interview protocol included one item that asks respondents to rate their satisfaction with “the amount of involvement (they) were allowed in making decisions for the project” (Appendix F: item 34b). A third item assesses satisfaction with “the amount of time spent planning for project implementation” (Appendix F: item 34c). In regards to the operational stage, a fourth item asks respondents their satisfaction with “the project-specific activities done during the operational stage” (Appendix F: item 34d).

Satisfaction with communication is evaluated at both the inter- and intra-university levels. In order to determine the amount of satisfaction at both levels, one item asks the respondents their satisfaction with “communication frequency among all partners” (Appendix F: item 34e). An additional item asks the respondents to rate their satisfaction with “methods of communicating with all partners” (Appendix F: item 34f). Also, respondents were asked their

satisfaction with “communication frequency within (their) universit(ies)” (Appendix F: items 34g).

A rational assumption, that satisfaction with the alignment of resources within a university affects PI satisfaction with a partnership, also is assessed. To understand the perceived adequacy of funding allocation, respondents their satisfaction with “the allocation of university resources that (they) needed” (Appendix F: item 34h).

An exploratory principle components factor analysis was conducted to determine if the items for measuring satisfaction with partnership processes constituted a scale that could be used in further analyses. The analysis determined the items constituted one factor. Two items, “*Communication frequency within my university*” and “*the allocation of university resources that I needed*” (Appendix F: items 34g-h) were removed from the factor because they caused a reduction in the factor’s reliability. The resulting six-item factor (items 34a-f) explained 48.39% of the variance in satisfaction with partnership processes (see Table 6). Each respondent’s total score for the six items was calculated and averaged for the satisfaction with partnership processes measure (Cronbach’s Alpha = .78). The measure’s scale mean was 3.99 (S.D. =.50).

Table 6.

Exploratory Factor Analysis Results for Satisfaction with Partnership Processes

Item	Factor Loading 1	Communality
Activities related to the development of project goals	0.78	0.61
The amount of involvement you were allowed in making decisions for the project	0.63	0.39
Amount of time spent planning for project implementation	0.80	0.65
The project-specific activities done during the operational stage	0.68	0.46
Communication frequency with all partners	0.63	0.39
Methods of communicating with all partners	0.63	0.40
Eigenvalue Variance Explained	2.90	Total Variance 48.39%

Based on reason, a willingness to participate in a partnership again is a possible indicator of satisfaction with the focal partnership. Thus, the interview protocol contains two items related to a willingness to partner again. The first asks the respondent to agree or disagree with the following statement, “I would be willing to participate in another partnership of this type.” Responses to this item were rated on a five-point likert scale where 1= “strongly disagree” and 5= “strongly agree” (Appendix F: item 36). The second item is open-ended and asks, “why or why not would you be willing to partner again?” (Appendix F: item 37).

Perceptions of project success. One rational assumption is that project success could be interpreted differently by PIs. Accordingly, project success is measured by responses to one item that asks each respondent rate the success of the project. Responses to this item were rated

according to a five-point likert scale where 1= “not at all successful” and 5= “very successful” (Appendix F: item 42).

Goal achievement. In order to assess how well the partnership allowed respondents to achieve personal goals, one open-ended item asks participants to explain what they personally got out of participating the in the partnership (Appendix F: item 41).

To evaluate the relationship between the partnership and the achievement of university-level goals, one set of items directly connects university motivations for partnering to the goals (i.e., based on these motivations) that the university was able to achieve through partnering. The extent to which university-level goals were achieved through the partnership is evaluated on a five-point likert scale where 1= “no extent” and 5= “a very large extent”. This set of items and its full scale are presented in Appendix F as items 38a-g.

An exploratory factor analysis determined that items for item 38 constituted one factor. Factor loadings indicated that three items loaded onto one factor (items 38a, b & f) and three items loaded highly onto a second factor (items 38c-e). However, because these items were not logically grouped, the rational decision was made to create a single factor based on two items (items 38a-b). All other factors (items 38c-f) were removed from this factor because their inclusion reduced reliability. The two-item factor explained 70.79% of the variance in the extent to which access to resources was achieved (see Table 7). Each respondent’s scores for the two items were totaled and then averaged for the resource access achievement measure (Cronbach’s Alpha = .59). The measure’s scale mean was 3.12 (S.D. =.1.23).

Table 7.

Exploratory Factor Analysis Results for Resource Access Achievement

Item	Factor Loading	
	1	Communality
Increased access to tangible resources	0.84	0.71
Increased access to human resources	0.84	0.71
Eigenvalue	1.42	Total Variance
Variance Explained		70.79%

Two of the variables that did not load on the factor “*an improvement in quality research and educational programming for your academic department*” (Appendix F: item 38d), and “*an improvement in the rate and success of underrepresented groups*” (Appendix F: item 38f) were judged to be sufficiently important to warrant their inclusion in further analyses as individual variables.

Data Analyses

All variables in the data set were evaluated for missing data, normality, skewness and kurtosis. To avoid problems associated with missing data Tabachnick & Fidell (2001) suggest replacing each missing score with the mean score for that item. In the current study, for missing scores that were single-item variables, group means (i.e., of the PI group relative to the respondent with the missing score) were calculated to replace that missing score. This technique was used to eliminate missing data for item #4a (2 scores), #7a (2 scores) and #8 (1 score). For missing scores that were part of a variable set of items, means were calculated for those respondents who had responded to at least 50% of the items in the set (i.e., casewise means). This technique was used for item set #13 (1 score for 1 respondent), item set #27 (1 score each for 5 respondents & 2 scores each for 3 respondents), item set # (1 score each for 2 respondents

& 2 scores each for 3 respondents), item set #35 (1 score each for 2 respondents) and item set #38 (1 score for 1 respondent). Respondents who did not provide enough data for the latter estimation technique were removed from the study. As explained earlier, there were three such respondents (i.e., two HBCU PIs and one PWI PI). Thus, the analyses that follow are based on data from 26 partnerships.

Highly skewed and non-normal variables included items #4a (the percentage of total funding the respondent's university received for participating in the partnership), #6a (the number of faculty members involved from all institutions), #7 (the total number of students involved in the project from all partner universities), #8 (the total number of students involved in the project from the respondent's university), #20 (the number of times the respondent communicated face-to-face with the partner faculty during the planning stages), #22 (the number of times the respondent communicated face-to-face with faculty members within own university during the planning stages), as well as the calculated distance between each respondent's university and the most collaborative university. For the purposes of analyses of variance and regression procedures, these data were transformed to the natural log.

The cleaned data were analyzed for significant differences based on the respondents' PI group. For continuous data, omnibus analysis of variance procedures were conducted. When an overall significant difference in means was detected, post hoc pairwise comparisons were done using the Bonferroni analysis. Data on categorical variables were analyzed using Chi-square tests of independence. Due to the small sample size and a need for increased power, the significance level for all data analyses was set at .10.

Predictive analyses followed a trimming approach (Linblad, 2004). First, bivariate regression analyses were run to determine the significance of all predictors of each outcome

measure. Next, those predictors that were significant were tested in stepwise multiple regression analyses for the final predictive models. For the purposes of these analyses, standardized beta coefficients are used as effect size parameters. A statistical significance of $p < .10$ was used.

A qualitative analysis was performed based on responses to the open-ended items. Each open-ended interview item was designed to specifically gain insight into one of ten partnership aspects: 1) the nature and goals of the partnership; 2) university motivation for supporting the partnership; 3) the goal development process; 4) plans for implementing the project; 5) the process of implementing the project; 6) reasons for partnering again; 7) reasons for not partnering again; 8) partnership obstacles; 9) partnership facilitators; 10) respondent's personal benefits of partnering. Included in this analysis are the responses from the HBCU PIs (n=8), PWI PIs (n=8) and PWI2 PIs (n=10).

In order to uncover and compare themes, a grounded theory method was used. First, all qualitative data were transcribed from the 26 participants' audio-recorded responses to the questions posed. Then, using the qualitative analysis software Atlas.ti, the responses were coded with very specific content codes. The advantage of doing this is that the generated codes reflected few assumptions about the themes that would emerge. However, because the code list became lengthy, many codes were re-coded so that they began with the aspect of partnerships to which it pertained. For instance, an example response regarding the *partnership facilitators* aspect, "I think that the fact that we all knew each other prior to even entering into the partnership. That was a huge part of the success" was coded as "facilitator: previously knowing partner." Several responses were relevant to multiple partnership aspects. Such responses were coded so that each of the appropriate aspects was listed at the beginning of the code. As codes

emerged during the coding process, already coded phrases were reviewed to assess the possibility of re-coding based on the new codes.

To determine the reliability of the codes generated, a reliability check was performed. Specifically, a Psychology graduate student trained in qualitative research used already established codes and code definitions to assess a sample of the interview data (15%). The reliability of the coding was determined by calculating the percentage of agreement between the two coders. Inter-rater agreement was 86.7%.

Next, codes first were grouped according to partnership aspect and then according to concept. Data analysis yielded multiple themes for each partnership aspect. Finally, the percentage of participants within each group who gave responses for each theme was calculated. For many of the items, many PIs gave multiple responses. For instance, several PIs reported more than one project goal, partnership facilitator or partnership obstacle. Therefore, in many cases, the calculated response percentages exceed 100%. Also, only major themes are reflected in the results. A small number of respondents did not make comments that corresponded to a theme. Thus, there are a few instances in which the calculated response percentages for individual PI groups are less than 100%.

Where a qualitative finding is relevant to a quantitative outcome, it is included immediately following the description of the quantitative outcome. Qualitative findings that are not especially relevant to any quantitative findings are described in the “Qualitative Results” section.

Results

This section provides an overview of the descriptive statistics and the results of comparative, bivariate and multiple regression analyses. As explained, two objectives of the present study were to identify the major characteristics of HBCU-PWI partnerships and to compare the characteristics of those collaborations to PWI-PWI partnerships. The following groups of variables were examined in the current analysis: a) PI characteristics (i.e., departmental affiliation, institutional affiliation, faculty status, gender, and ethnicity), b) partnership structure (i.e., the classification of partner institutions, the number of partner universities, and the institutions that were formal leads, data on project goals, the allocation of funding and the physical distance between them, and the number of faculty and students involved in the partnership), c) partnership processes (i.e., partnership conception, PI motivation for partnering, PI level of involvement during each stage of the partnership, communication frequency, allocation of university resources and the nature of working relationships) and d) partnership outcome variables (partnership success, partnership satisfaction with process and outcomes and achievement of university-level goals).

Descriptive and Comparative Results

Respondent Characteristics

As mentioned, the PI sampling frame for this study consists of three groups: 1) HBCU PIs (n=8); 2) PWI PIs (n=8), and 3) PWI2s (n=10). The HBCU PIs interviewed were constituents of the Physics (n=1), Biology (n=2), but were heavily concentrated in the Engineering (n=5; i.e., mechanical, electrical, computer and chemical) Departments of their respective universities. The PWI PIs interviewed were faculty of the Soil Science (n=1), Computer Science (n=1), Biostatistics (n=1) Engineering (n=2; i.e., electrical and biomedical)

and Medicine (n=3) Departments. The PWI2 PIs came from a very diverse set of departments including: Biology, Chemistry & Biomedical Engineering, Electrical Engineering, Entomology, Food Science, Horticultural Science, Industrial Engineering, Pharmaceutical Outcomes and Policy, Plant Pathology and Medicine. As shown in Table 8, the majority of the PIs participating in the sampled partnerships were tenured or tenure-track male faculty at research institutions. All African-American PI study participants were affiliated with an HBCU. In fact, the occurrence of African-American PIs for HBCUs was found to be significantly higher than for PWIs or PWI2s, $\chi^2(2, N = 26) = 10.63, p=.005$.

Table 8.

Summary of PI Characteristics

Data Source	Respondent Affiliated with Lead University (%)	Female PIs (%)	African- American PIs (%) ^a	PIs full professor status (%)	PIs tenured or in tenure-track position (%)
HBCU PIs	50.0	12.5	50.0	75.0	100.0
PWI PIs	37.5	12.5	0	75.0	100.0
PWI2 PIs	30.0	0	0	50.0	100.0

^a $p < .01$ *Partnership Structure*

Each respondent was asked the number of partners involved in their partnerships. Surprisingly, the typical respondent reported being involved with approximately four

institutions (HBCU $M=4.00$; PWI $M=4.63$; PWI2 $M=5.00$). In fact, the majority of the partnerships were multiple-university partnerships (PWI = 62.5%, HBCU = 87.5%, PWI2 = 100%). PI reports of the number of universities involved in their partnerships did not differ significantly. HBCUs were designated as formal lead in 50% of the partnerships described by HBCU PIs and 50% of the partnerships described by PWI PIs. About a third of PWI2 PIs (30%) and PWI PIs (37.5%) and half of the HBCU PIs (50%) interviewed were affiliated with their projects' lead universities. These frequencies were not found to be significantly different.

All PIs were asked to assess the importance of the following aspects to their partnership projects: a) research and/or knowledge creation; b) research training of undergraduate and graduate students; c) the development of curriculum; and d) the research training or education of underrepresented groups to their partnerships. Responses were based on a five-point likert scale, where 1= "not at all important" and 5= "very important". The mean responses for all groups are shown in Table 9.

Table 9.

Mean Responses for the Importance of Partnership Aspects

	HBCU PI <i>M (SD)</i>	PWI PI <i>M (SD)</i>	PWI2 PIs <i>M (SD)</i>
Research and/or knowledge creation	4.25 (1.16)	4.5 (0.76)	4.70 (0.48)
Research training of undergraduate and graduate students*	4.25 (1.04) ^a	4.25 (1.16) ^b	3.00 (0.94) ^{a b}
The development of curriculum**	3.63 (1.30) ^a	2.88 (1.55) ^b	1.20 (0.63) ^{a b}
The research training or education of underrepresented groups**	4.50 (0.76) ^a	4.13 (1.36) ^b	2.00 (1.56) ^{a b}

*p<.05

** p<.01

^a significant differences lie between the HBCU PI and PWI2 groups (p<.01).^b significant differences lie between the PWI PI and PWI2 groups (p<.01).

The mean rating for *the importance of research training of undergraduate students and graduate students* was higher for HBCU PIs ($M = 4.25$, $SD = 1.04$) than for PWI PIs ($M = 4.14$, $SD = 1.21$) and PWI2 PIs ($M = 3.00$, $SD = 0.94$). These mean differences were found to be significant across all groups, $F(2,23) = 4.42$, $p = .02$. Post hoc pairwise comparisons showed significant differences between mean responses for HBCU PIs and PWI2 PIs ($p = .06$) and PWI PIs and PWI2 PIs ($p = .06$).

HBCU PIs also gave a higher mean rating ($M = 3.63$, $SD = 1.30$) for *the importance of the development of curriculum* than did PWI PIs ($M = 2.88$, $SD = 1.55$) and PWI2 PIs ($M = 1.20$, $SD = 0.63$). These mean differences were significant across all groups, $F(2,23) = 9.99$ (p

=.001). Pairwise mean comparisons showed a significant difference between the HBCU PIs and the PWI2 PIs ($p=.001$) and PWI PIs and PWI2 PIs ($p = .02$).

Similarly, HBCU PIs gave a higher mean rating ($M = 4.50, SD = 0.76$) for *the importance of the research training or education of underrepresented groups* than PWI PIs ($M= 4.13, SD = 1.36$) and PWI2 PIs ($M = 2.00, SD = 1.56$). These mean differences were significant across all groups, $F(2,23) = 9.90, p = .001$. Pairwise mean comparisons showed significantly different mean ratings for HBCU PIs and PWI2 PIs ($p=.001$) and PWI PIs and PWI2 PIs ($p=.007$).

In addition to rating the importance of specific partnership aspects, respondents were asked to describe their partnership's nature and goals. Table 10 displays the responses of each PI group to the question, *Could you briefly describe for me the nature and goals of the project?* Five themes emerged: 1) collaborative research as a goal; 2) collaborative research as a strategy; 3) educational pipeline strengthening; 4) providing resources for a target population; and 5) infrastructure development. Some PIs reported more than one goal or important aspect of their projects; thus, total percentage of respondents giving answers related to each theme is greater than 100%.

Table 10.

Summary of Qualitative Results for Nature and Goals of Partnership Project

Interview Item								
<i>Item 1. Could you briefly describe for me the nature and goals of the project?</i>								
	HBCU		PWI		PWI2		Total responders	
Total PI Sample	8		8		10		26	
Number PIs who answered this question	8		8		10		26	
	% of respondents per group (number PIs responding)						% of total responders	
Themes	HBCU		PWI		PWI2			
Collaborative Research as a Goal	37.5	(3)	37.5	(3)	90.0	(9)	57.7	
Collaborative Research as a Strategy	62.5	(5)	62.5	(5)	10.0	(1)	42.3	
Educational Pipeline Strengthening	62.5	(5)	50.0	(4)	10.0	(1)	38.5	
Providing Resources for a target population	50.0	(4)	12.5	(1)	10.0	(1)	23.1	
Infrastructure development	50.0	(4)	12.5	(1)	0		19.2	

Collaborative Research as a Goal. More than half of all PIs explicitly mentioned research goals as an aspect of their partnership projects, with PWI2 PIs doing so more often than HBCU or PWI PIs (HBCU = 37.5%; PWI = 37.5%; PWI2 = 90.0%). Research areas ranged greatly and included agricultural research, research to address health disparities, producing cameras, producing power electronics, producing vaccines, and animal science research.

Collaborative Research as a Strategy. In the remaining cases, PIs mentioned research as a strategy for reaching partnership project goals (PWI2 = 10.0%; HBCU = 62.5%; PWI = 62.5%). For example, one PI acknowledged:

“Research was not an explicit goal of the original grant, but it was a modification or adjustment that we made for phase II. The research focus has changed and we have added the additional goal of exposing undergraduate students to research.”-HBCU PI

Educational Pipeline Strengthening. Several respondents reported that the stated goals of their partnerships included strengthening a part of the educational pipeline for underrepresented groups in at least one of the STEM disciplines (PWI2 = 10.0%; PWI = 50.0%; HBCU = 62.5%). As one PI described his partnership’s goals:

“The original goal was to increase the pipeline and subsequent goals have included maintaining the pipeline and now increasing the pipeline for graduate education.” - HBCU PI

Providing Resources for a Target Population. Some PIs responded that one of the most important aspects of their partnership project was to provide a resource for a target population (PWI2 = 10.0%; PWI = 12.5%; HBCU = 50.0%), such as students or community members. For example, one PI explained:

“As so we looked for ways that we could get assessments of community needs and then looked to see how our particular expertise that existed within our institute could be deployed to help meet some of these needs.” – HBCU PI

Infrastructure Development. In a few cases, PIs listed infrastructure development as an important partnership project aspect (PWI = 12.5%; HBCU = 50.0%). Both research and curriculum development were cited as instances of infrastructure building. One HBCU PI highlighted building research infrastructure when he was asked to describe his partnership project:

“...looking at research clusters that could be created so the faculty at (the PWI) could help the faculty at the HBCUs become more research productive.” –HBCU PI

In summary, all PIs reported research as an important partnership aspect. However, almost all PWI2 PIs reported it to be an explicit partnership goal, while only about a third of HBCU and PWI PIs reported it as such. Those who did not express research as a goal did note that collaborative research was used as a means to attain other goals. One such goal, strengthening the educational pipeline for underrepresented groups, was mentioned by more than half of all HBCU PIs and half of PWI PIs, but only a tenth of PWI2 PIs. Providing resources for a target population was an important aspect for half of HBCU PIs, but only about a tenth of PWI and PWI2 PIs. Developing infrastructure was mentioned as an important aspect by half of HBCU PIs and about a tenth of PWI PIs; however, no PWI2 PIs reported this to be a relevant aspect.

PIs were also asked to report the percentage of project funding that they or their universities received for their participation in the partnership. On average, HBCU PIs reported the proportion allotted to them to be slightly lower ($M=45.31$, $SD=35.92$) than did PWI PIs involved in similar partnerships ($M=51.13$, $SD=24.29$). The PWI2s reported receiving a smaller share of project funds ($M=24.90$, $SD=23.17$) than both the other two PI groups. Comparisons across all groups were based on the logged percentage of funding allotted to each university (see Appendix G). These mean differences were significant across all groups, $F(2,23) = 2.72$, $p = .09$. Pairwise mean comparisons showed significantly different mean allotments for PWI PI and PWI2 PI groups ($p = .10$).

Additionally, PIs were asked the number of faculty and students involved in their partnerships, and the distance between their universities and the university with which they reported having the most communication was calculated. Central tendencies for these variables are presented in Table 11. Group comparisons are based on the log of the calculated distance (see Appendix G). An omnibus analysis of variance of the mean logged number of faculty involved in the partnerships revealed significant mean differences, $F(2,23) = 4.69$, $p = .02$; results of a post hoc analysis showed that HBCU PIs had a significantly higher mean logged number of involved faculty ($M = 9.63$, $SD = 8.63$) than did PWI PIs ($M = 2.88$, $SD = 1.96$), $p = .07$. The mean logged number of faculty reported to be involved in partnerships by HBCU PIs was also significantly higher than that reported by PWI2 PIs ($M = 3.10$, $SD = 2.96$), $p = .03$.

When asked the number of students participating in their partnerships across all partner universities, HBCU PIs reported a significantly higher number of students ($M = 55.75$, $SD = 64.76$) than either PWI PIs ($M = 21.37$, $SD = 40.36$) or PWI2 PIs ($M = 7.50$, $SD = 5.10$). An omnibus analysis of variance, based on the log of the total number of students (see Appendix

G), revealed significant differences overall, $F(2, 23) = 3.54, p = .05$. Specifically, the mean logged number of students involved in partnerships reported by HBCU PIs was significantly higher than the mean logged number reported by PWI2 PIs ($p = .06$).

When asked specifically about the number of students from their respective universities who were involved in the partnerships, HBCU PIs reported a much higher number of students ($M = 20.25$) than did PWI PIs ($M = 3.75$) and PWI2 PIs ($M = 1.80$). Based on the log of the total number of students involved from the PIs university (see Appendix G), these means were significantly different, $F(2,23) = 6.13, p = .01$. In fact, pairwise comparisons showed that the mean logged number of HBCU students was significantly higher than that reported by PWI PIs ($p = .03$) and PWI2 PIs ($p = .01$).

The distance between each respondent's university and the partner university most collaborated with was also analyzed. The greatest mean distance was found for PWI2 partners ($M = 645.91, SD = 834.28$), followed by HBCU partners ($M = 321.42, SD = 547.22$) and PWI partners ($M = 258.62, SD = 276.62$). Group comparisons were performed using the logged distances (see Appendix G). Mean differences in the logged distance were not found to be statistically significant.

Table 11.

Structural Characteristics of HBCU-PWI and PWI-PWI Partnerships

	HBCU		PWI		PWI2	
	<i>M (SD)</i>	<i>Mdn</i>	<i>M (SD)</i>	<i>Mdn</i>	<i>M (SD)</i>	<i>Mdn</i>
Number of Faculty Involved* ^a	9.63 (8.63) ^{c d}	5.50	2.88 (1.96) ^c	2.00	3.10 (2.96) ^d	2.00
Number of Students Involved* ^a	55.75 (64.76) ^d	46.00	21.37 (40.36)	4.00	7.50 (5.10) ^d	6.50
Distance (miles) ^b	321.42 (547.22)	84.98	258.62 (276.62)	180.17	645.91 (834.28)	293.35

* $p < .10$ ^a based on the total number reported to be involved across all partner universities.

Comparisons are based on the log of the total number (not reported here).

^b based on the calculated distance between each respondent's university and the partner university the respondent most closely worked with during the partnership. Comparisons are based on the log of the calculated distance (not reported here).^c significant difference lies between the HBCU PI and PWI (HBCU-PWI) groups ($p < .10$).^d significant difference lies between the HBCU PI and PWI2 groups ($p < .10$)*Partnership Processes*

Respondents were also asked about who initiated the partnerships. Specifically, PIs were asked to report who first conceived of the partnership-based project. Most respondents indicated it was a joint idea between them and the partner PI (HBCU=62.5%; PWI=50%, PWI2=40%). Somewhat fewer PIs indicated faculty at the other university conceived of the partnership (HBCU=25%; PWI=25%; PWI2=20%). Some PIs indicated they conceived of the partnership (HBCU=12.5%; PWI=12.5%; PWI2=20%). In surprisingly few cases, PIs reported that an administrator conceived of the partnership (PWI = 12.5%; PWI = 20%). There were no significant differences found among these groups regarding who initiated their partnerships.

Respondents were asked their personal motivation to participate in the partnership. The majority of the respondents reported that they participated simply because the partnership was their idea (HBCU = 50%, PWI = 50%, PWI2 = 30% respectively), or a colleague encouraged them to participate (HBCU = 37.5%, PWI = 25%, PWI2 = 30%). Respondents also reported deciding to participate because it fit departmental plans for the curriculum (HBCU = 12.5%; PWI2 = 20%); they wanted to work with a specific faculty member who was affiliated with another university (PWI = 25%), an administrator suggested they participate (PWI2 = 10%) or the funding agency required a partnership (PWI2 = 10%). For the purposes of analysis, motivations to partner because it “fit departmental plans for the curriculum”, because of the desire “to work with a specific faculty member”, because “the funding agency required a partnership” and because “an administrator suggested they participate” were grouped together as an “other” category. Despite this grouping, there were no significant differences in motivations for partnering among the groups.

An open-ended question solicited respondents’ opinions of why their universities were motivated to support partnership arrangements. Table 12 displays the responses of each PI group. Two themes emerged: the university was not presented with option to partner and the nature of the project or funding agency solicitation. Although all PIs answered this question, some responses did not fit into one of these two themes.

Table 12.

Summary of Qualitative Results for Perceived University Motivation to Partner

Interview Item							
<i>Item 14. In your opinion, what motivated your university to support a partnership instead of pursuing the project alone?</i>							
	HBCU		PWI		PWI2		Total responders
Total PI Sample	8		8		10		26
Number PIs who answered this question	8		8		10		26
	% of respondents per group (number PIs responding)						% of total responders
Major Themes	HBCU		PWI		PWI2		
Nature of project or agency solicitation	62.5	(5)	50.0	(4)	30.0	(3)	46.2
University not presented with option to partner	12.5	(1)	25.0	(2)	50.0	(5)	30.7

Interestingly, quite a few PIs noted that their universities were not involved in the decision to partner (HBCU = 12.5%; PWI = 25.0%; PWI2 = 50.0%). In fact, one PI commented:

“It wasn’t presented as an option. I decided I wanted to do this and they just went along with it.” – PWI2 PI

Other PIs said that the nature of the partnership or the solicitation for proposals from the funding agency dictated inter-university partnerships (PWI = 25.0%; PWI2 = 30.0%; HBCU = 37.5%). As one PI reflected:

“It really wasn't an option; the solicitation insisted that it be a partnership. NSF insisted that it be an alliance, that it be a mixture of universities. They didn't dictate which universities, didn't really dictate that it be a mixture of majority and HBCUs, but we figured out very quickly that that would be what it would take to be responsive to this opportunity.” -HBCU PI

In summary, half of the PWI2 PIs reported a lack of university administration involvement in the decision to partner, while only a quarter of PWI PIs and only one HBCU PI noted the same. About a third of HBCU PIs and PWI2 PIs and a quarter of PWI PIs noted that a partnership was required, either by the project itself or by the funding agency.

Principal investigators were also asked to rate the extent to which their institutions made arrangements for them to be involved in the partnership project. As described earlier, a “university resources” scale was created from several of the items regarding institutional arrangements. The mean responses, shown in Table 13 were based on a five-point likert scale where 1= “no extent” and 5= “a very large extent”. Contrary to expectations, HBCU PIs reported receiving university resources to a greater extent ($M = 2.44, SD = 1.33$) than did PWI PIs ($M = 1.81, SD = 1.91$) and PWI2 PIs ($M = 1.23, SD = 0.25$). Overall mean differences reached the specified .10 significance level, $F(2, 23) = 3.29, p=.06$. Specifically, HBCU PIs reported receiving university resources to a significantly greater extent than PWI2 PIs ($p=.05$).

The degree of participation in the partnership was assessed by asking PIs about their level of involvement in planning and operating the project, communication, and the closeness of working relationships.

First, PIs were asked which formal roles they fulfilled for the partnership project (writing the proposal for the project, leading activities for planning the project, managing the overall project, managing the project on their respective campuses, conducting research, supervising students, providing extension assistance and the writing of publications and reports), and a total number of roles was calculated. PIs reported involvement in about 5 to 6 roles [HBCU PIs ($M=6.5$); PWI PIs ($M=5.87$); PWI2s ($M=6.40$)]. No mean differences in the number of roles performed by the PI groups were found to be significant.

Research participants were also asked the extent to which they contributed to decisions during the planning stage and operational stages. As previously explained, two corresponding scales were created: *planning decision making* and *operational decision making*. Responses for both measures were based on a five-point likert scale, where 1= “not at all” and 5= “a very large extent”. On average, HBCU PIs reported being involved in making decisions during planning their projects to a slightly greater extent than both PWI PIs and PWI2s. However, PWI2 PIs reported slightly more involvement in decision making during the actual operation of their projects than did both HBCU PIs and PWI PIs. Means for the data are described in Table 13. No PI groups were found to have significantly different mean levels of decision making at either stage.

As described previously, two items regarding how PIs characterized their partnerships provided a measure of *partner equality*. Responses for this measure were based on a five-point likert scale, where 1= “strongly disagree” and 5= “strongly agree”. On average, PWI PIs more strongly agreed that their partnerships were characterized by partner equality than were HBCU PIs and PWI2 PIs. Mean responses are shown in Table 13. There were no significant differences among the groups.

Two items regarding how PIs characterized their partnerships provided a measure of *partner capability*. Responses for this measure were based on a five-point likert scale, where 1= “strongly disagree” and 5= “strongly agree”. On average, PWI2 PIs gave slightly higher ratings for partner capability than did HBCU PIs and PWI PIs. Mean responses are shown in Table 13. There were no significant differences among the groups.

Table 13.

Mean Responses for Scaled Partnership Process Measures

Scaled Measure	HBCU	PWI	PWI2
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Resources*	2.44 (1.33) ^a	1.81 (1.91)	1.23 (.25) ^a
Planning Decision Making	4.09 (0.84)	3.84 (1.25)	3.85 (1.14)
Operational Decision Making	3.74 (0.72)	3.49 (1.24)	3.89 (0.78)
Partner Equality	4.25 (0.76)	4.50 (0.60)	4.20 (1.18)
Partner Capability	4.38 (0.52)	4.38 (0.88)	4.75 (0.42)

*p<.10

^a significant differences lie between the HBCU PI and PWI2 groups (p<.10).

Respondents were asked about the frequency of inter-university communication through both face-to-face meetings and e-mail correspondence during the planning and operational stages. Additionally, for those partner universities that had more than one faculty member collaborating on an inter-university project (n=20), additional items were included in the interview protocol that ask about the frequency of intra-university communication during the planning and operational stages. Responses to items pertaining to the frequency of face-to-face communication between universities and with the partner university faculty and within universities during the planning stage were based on respondent’s estimates of the number of

times such communication occurred. Central tendencies of all PI responses are shown in Table 14. Overall, face-to-face communication during the operational stage of the partnerships was much greater for all groups than during the planning stage. Due to the non-normality of data on face-to-face communication with partner faculty during the planning stage and data on face-to-face communication with faculty within respondent's own university during the planning stage, comparison analyses were performed using the logged number of times of communication (see Appendix G). Comparisons of the frequency of face-to-face interaction between the respondent and the partner faculty and between the respondent and partnership-involved faculty within own university that took place during the planning and operational stages revealed no significant differences among PI groups.

The frequency of e-mail correspondence during the planning stage and the frequency of e-mail correspondence and face-to-face meeting during the operational stage were evaluated on a five-point likert scale where 1= "once" and 5= "almost daily". Central tendencies of all PI responses are shown in Table 14. On average, most PIs reported communicating by e-mail with partner faculty during the planning and operational stages at least once a month. Similarly, during the planning and operational stage, most PIs reported e-mail communication with partnership-involved faculty within their own universities at least one a month. No significant group differences were found for frequency of e-mail communication occurring between the respondent and partner faculty or between the respondent and partnership-involved faculty at own university during neither the planning or operational stages of the partnerships.

Table 14.

Mean Frequencies of Face-to-Face and e-mail Communication during Partnership Planning and Operational Stages

	partnership type	with university partner		with partnership-involved faculty at respondent's university ^a	
		face-to-face	e-mail	face-to-face	e-mail
		<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>
planning stage	HBCU	4.81(4.16) ^b	3.75(0.71) ^c	41.63(36.49) ^b	3.88(0.64) ^c
	PWI	28.00(69.60) ^b	3.25(1.04) ^c	75.17(79.03) ^b	4.17(1.60) ^c
	PWI2	3.30 (2.79) ^b	3.40(0.52) ^c	79.17(140.25) ^b	4.00(0.89) ^c
operational stage	HBCU	2.25(1.04) ^c	3.63(0.92) ^c	4.13(0.64) ^c	3.75(1.16) ^c
	PWI	2.00(1.51) ^c	3.38(0.74) ^c	3.14(1.35) ^c	3.43(0.98) ^c
	PWI2	1.40(.70) ^c	3.40(.52) ^c	4.33(.82) ^c	3.83(.41) ^c

^a *n* =21

^bData are based on the number of times communication took place

^cData are based on responses to a five-point likert scale, where 1=once, 2=at least every other month, 3=at least once a month, 4=at least once a week and 5=almost daily

Also, PIs were asked where they met when they communicated face-to-face with faculty from the specified partner university. The majority of the PIs responded that the location of meetings altered among the partners' campuses (HBCU = 50%, PWI = 50%, PWI2 = 60%). Some PIs stated that their university's campus was the meeting site (HBCU = 12.5%, PWI = 25%, PWI2 = 10%). A few PIs reported that the partner university was the location of meetings (HBCU = 12.5%, PWI = 12.5%, PWI2 = 10%); yet others responded that a neutral meeting place (i.e., at no partner's campus) was the location of face-to-face meetings (HBCU =

25%, PWI2 = 10%). The remaining PIs reported that they never had face-to-face meetings with their partners (PWI = 12.5%, PWI2 = 10%). There were no significant differences found among these groups in the locations of face-to-face meetings.

Partnership Outcomes. PIs were asked several items for the purposes of evaluating the outcomes of the partnership. As described, a scale was created to measure the outcome *satisfaction with partnership processes*. Responses were based on a likert scale where 1= “very dissatisfied” and 5= “very satisfied”. Though on average PWI2 PIs reported being slightly more satisfied than their HBCU and PWI counterparts, all PI groups mean ratings of their satisfaction with partnership processes were relatively high. Differences among mean ratings for these groups were not statistically significant. Means for each group’s ratings of satisfaction with partnership processes are shown in Table 15.

Table 15.

Mean Responses for Partnership Outcome Measures

Measure	HBCU	PWI	PWI2
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Satisfaction with Partnership Processes	3.90 (0.27)	4.08 (0.46)	4.00 (0.67)
Satisfaction with Project Outcomes	3.88 (0.83)	3.75 (1.16)	4.10 (0.32)
Perceptions of Partnership Success	4.13 (0.64)	4.25 (0.71)	4.30 (0.82)
Resource Access Achievement	3.50 (1.31)	3.25 (1.46)	2.70 (0.92)
Achievement of Research and Education Improvement	4.25 (0.71)	3.56 (0.82)	3.80 (0.79)
Achievement of Improvement in Success of Underrepresented Groups*	4.25 (0.89) ^a	3.88 (1.36) ^{a b}	1.90 (0.88) ^b
Willingness to Participate Again	4.50 (0.53)	4.38 (1.41)	4.80 (0.42)

* $p < .001$ ^a significant differences lie between the HBCU PI and PWI PI groups ($p < .001$)^b significant differences lie between the PWI PI and PWI2 PI groups ($p < .01$)

Satisfaction with project outcomes was measured with a single item, whose responses were rated on a likert scale where 1= “very dissatisfied” and 5 = “very satisfied.” Overall, ratings of satisfaction with outcomes was rather high (see Table 15). Though PWI2 PIs reported the highest mean level of satisfaction with the outcomes of projects, no group mean ratings were found to be statistically significant.

When asked how highly they would rate the success of their partnership (responses based on a likert scale where 1= “not at all successful” and 5= “very successful”), PWI2 PIs rated *partnership success* more highly than did HBCU and PWI PIs. These slight differences in mean ratings of success were not statistically significant (see Table 15).

As explained above, *resource access achievement*, which helps to describe the partnerships' contribution to the achievement of resource access, was measured with a scale based on two items related to both human and tangible resources. Responses to this measure were based on a likert-type scale where 1= "no extent" and 5= "a very large extent". On average, HBCU PIs reported a higher extent of access to resources than PWI and PWI2 PIs; however, differences in group means were not found to be statistically significant (see Table 15).

Similarly, when asked *the extent to which the partnership fostered an improvement in research and educational programming for their academic departments* (responses based on a likert scale where 1= "no extent" and 5= "a very large extent"), HBCU PIs again reported having achieved this to a greater extent than did PWI PIs and PWI2 PIs. Differences in group means, however, were not found to be statistically significant (see Table 15).

The *degree to which the partnership contributed to the improvement in the success of underrepresented groups* was measured with a single item, whose responses were based on a likert scale where 1= "no extent" and 5 = "a very large extent". An omnibus analysis of variance test revealed there were significant differences in the means among the groups, $F(2,23) = 13.35, p=.000$. Pairwise comparisons revealed that the mean rating of HBCU PIs ($M = 4.25, SD = 0.89$) was significantly higher than that of PWI PIs ($M = 3.88, SD = 1.36$), $p=.000$. The mean rating of PWI PIs was also significantly higher than that of PWI2 PIs ($M = 1.90, SD = 0.79$), $p = .002$ (see Table 15).

When asked if they would be willing to participate in another partnership of this type, (responses based on a likert scale where 1 = "not at all successful" and 5 = "very successful"), PWI2 PIs rated *willingness to participate again* slightly more highly than did HBCU and PWI

PIs. These slight differences in mean ratings of willingness to participate again were not statistically significant (see Table 15).

Table 16 displays the responses of each PI group to the open-ended question, *why or why not would you be willing to partner again?* Responses to this question followed PIs' ratings of their willingness to participate in another partnership of the same type. Some PIs gave more than one reason for partnering again or for not partnering again. Additionally, some PIs gave reasons both for partnering again *and* for not partnering again. Thus, the percentages displayed in Table 16 do not equal 100%. Table 16 shows rates of responses both for reasons for partnering again (i.e., number PIs who gave positive responses to this item) and for reasons against partnering again (i.e., number PIs who gave negative responses to this item).

Table 16.

Summary of Qualitative Results for Reasons for and Against Partnering Again

Interview Item							
<i>Item 37: Why or why not would you be willing to partner again?</i>							
	HBCU PI		PWI		PWI2		Total
Total PI Sample	8		8		10		26
Number PIs who gave positive responses to this item	8		7		10		25
	% of respondents per group (number PIs responding)						% of total PIs responding positively
Themes	HBCU PI		PWI		PWI2		
Access to Resources	62.5	(5)	57.1	(4)	50.0	(5)	56.0
Intended Outcomes	37.5	(3)	28.6	(2)	40.0	(4)	36.0
Administrators' Preference	25.0	(2)	28.6	(2)	30.0	(3)	28.0
Respondent's Personal Preference	0	(0)	28.6	(2)	40.0	(4)	24.0
	HBCU PI		PWI		PWI2		Total
Number PIs who gave negative responses to this item	3		2		3		8
	% of respondents per group (number PIs responding)						% of total PIs responding negatively
Themes	HBCU PI		PWI		PWI2		
Lack of Adequate Resources	100.0	(3)	100.0	(2)	33.3	(1)	75.0
Bureaucracy	33.3	(1)	0.0	(0)	66.7	(2)	37.5

Almost all respondents gave reasons that they would again participate in a similar partnership (96.1%). A high number of respondents reported that they would do so because in their previous experience with partnering, their access to resources increased (PWI2 = 50.0%; PWI = 57.1%; HBCU = 62.5%), including physical and human resources. As one PI aptly remarked:

“We get access to a lot of resources, not only human resources but other research resources that we couldn’t be expected to have here.” –HBCU PI

Several PIs responded that the intended outcomes of partnering would convince them to partner again (PWI = 28.6%; HBCU = 37.5%; PWI2 = 40.0%). The outcomes mentioned included the strengthening of university programs and benefits for the involved faculty, students and target communities. One PI referred to underrepresented students in his rationale for partnering again:

“If we are going to make a difference, then we have got to get our master’s students in the sciences and technology into PhD programs and to do that, I’ve got to partner.” – PWI PI

While some respondents reported that they would partner because of university and funding agency trends that support partnering (HBCU= 25.0%; PWI = 28.6%; PWI2 = 30.0%), still others said they would partner again simply because they appreciate the partnership process (PWI = 28.6%; PWI2 = 40.0%):

“I think we all made this comment – we really enjoy doing it because it was like going to summer camp. We did it as a team. We did it as a team, we’re still doing it as a team....” –PWI2 PI

Still, eight respondents remarked that they would hesitate to partner again for two main reasons. An increased workload, inadequate funding and a lack of time to participate were reasons constituting the “lack of adequate resources” theme that emerged. In fact, 33.3% of the three PWI2 PIs, all of the three HBCU PIs and both of the two PWI PIs mentioned a lack of resources. Bureaucracy, both within the partnered university structure and the funding agency structure, was also cited as problematic by 33.3% of the three HBCU PIs and 66.7% of the three PWI2 PIs.

“It’s a lot of paperwork for a relatively small amount of money - bureaucracy. Both universities and federal bureaucracy have impeded progress.” –PWI2 PI

In summary, the results of the open-ended analysis provide context for the high ratings PIs gave on their willingness to participate again in a similar partnership. At least half of the PIs in each of the PI groups indicated that increased access to resources would play a part in their future decisions to partner. More so than respondents from the PWI group, respondents from the HBCU and PWI2 groups indicated that the outcomes of the partnership would be a factor in their decision to partner again. Roughly a quarter of PIs in each group reported they would partner again because university administrators and funding agencies favor partnership

arrangements. However, about a quarter of respondents in the PWI group and almost half of respondents in the PWI2 group replied that they would again partner because they enjoy partnering.

Importantly, these findings also help to explain the hesitation some PIs would likely have in accepting future partnering arrangements. All HBCU and PWI PIs and a third of PWI2 PIs who gave reasons against partnering again cited a lack of inadequate resources. Bureaucracy within the university and funding agency were implicated by a third of HBCUs and two-thirds of PWI2 PIs who gave reasons against partnering.

Regression Analysis Results

Satisfaction with Partnership Processes

Appendix H shows the results of the bivariate regression analyses for satisfaction with partnership processes. Six of the 53 predictors tested were significant at the bivariate level. In the subsequent multiple regression analysis, four of the six predictors were still significant: perceptions of partnership success ($B= 0.24$), the extent to which the respondent previously knew the partner ($B= 0.48$), US citizenship ($B= -0.27$) and partner equality ($B= 0.39$). It is noteworthy that *non*-US citizenship was a positive and significant predictor of perceptions of partnership success. The extent to which the respondent previously knew the partner had the greatest effect on respondent satisfaction with processes. Together, the four predictors explained 71.5% of the variance in satisfaction with partnership processes. Table 17 presents the unstandardized and standardized beta weight coefficients for the variables included in the final model.

Table 17.

Summary of Multiple Regression Analyses for Predicting Partnership Outcomes

Variable	B	<i>B</i>	<i>p</i>
<u>Satisfaction with Processes</u>			
Perceptions of partnership success	0.17	0.24	0.09
Previously knew partner	0.15	0.48	0.00
PI is US citizen	-0.41	-0.27	0.04
Perceptions of partner equality	0.22	0.39	0.00
<i>R</i> ²	0.72		
<u>Satisfaction with Project Outcomes</u>			
Number of partner universities	.15	.43	.02
Number of roles performed by the respondent	.17	.41	.03
<i>R</i> ²	0.33		
<u>Perceptions of Partnership Success</u>			
Number of partner universities	0.15	0.49	0.00
Face-to-face meetings at respondent's university	0.32	0.23	0.07
Perceptions of partner performance	0.31	0.27	0.03
Satisfaction with partnership processes	0.74	0.52	0.00
<i>R</i> ²	0.74		
<u>Willingness to Participate Again</u>			
Face-to-face meetings at respondent's university	0.56	0.41	0.03
Perceptions of partnership success	0.46	0.38	0.04
<i>R</i> ²	0.45		

Table 17 (continued).

Variable	B	<i>B</i>	<i>p</i>
<u>Resource Access Achievement</u>			
University resources	0.67	0.60	0.00
Respondent is associate professor	1.38	0.48	0.00
Face-to-face meetings at respondent's university	-0.97	-0.29	0.04
	<i>R</i> ²	0.65	
<u>Achievement of Research and Education Improvement</u>			
University resources	0.33	0.45	0.01
Operational decision-making	0.35	0.40	0.02
	<i>R</i> ²	0.39	
<u>Achievement of Improvement in Success of Underrepresented Groups</u>			
Logged total number of students involved from all partner universities	1.60	0.61	0.00
PI is US citizen	1.39	0.31	0.05
	<i>R</i> ²	0.51	

Satisfaction with Project Outcomes

Appendix H shows the results of the bivariate regression analyses for satisfaction with project outcomes. Four of the 53 predictors tested were significant at the bivariate level. In the subsequent multiple regression analysis, two of the four variables were still significant: number of partners ($B = .43$) and the number of roles performed by the respondent ($B = .41$), with the number of partners having a slightly greater effect on respondent satisfaction with project

outcomes. Together, the two predictors explained 33.1% of the variance in satisfaction with project outcomes. Table 17 presents the unstandardized and standardized beta weight coefficients for the variables included in the final model.

Perceptions of Partnership Success

Appendix H shows the results of the bivariate regression analyses for perceptions of partnership success. Ten of the 53 predictors tested were significant at the bivariate level. In the subsequent multiple regression analysis, four of the ten predictors were still significant: the number of partners ($B = 0.49$), the alteration of meeting locations ($B = 0.23$), perceptions of partner performance ($B = 0.27$) and satisfaction with processes ($B = 0.51$). Respondent satisfaction with processes had the greatest effect on perceptions of partnership success. Together, the four predictors explained 74.0% of the variance in perceptions of partnership success. Table 17 presents the unstandardized and standardized beta weight coefficients for the variables included in the final model.

Willingness to Participate Again

Appendix H shows the results of the bivariate regression analyses for willingness to participate again in a similar partnership. Three of the 53 predictors tested were significant at the bivariate level. In the subsequent multiple regression analysis, two of the three predictors were still significant: perceptions of partner performance ($B = 0.41$) and perceptions of partnership success ($B = 0.38$), with respondent perceptions of partner performance having the greater effect on respondent willingness to participate again. Together, these two predictors explained 45.0% of the variance in willingness to participate again in a similar partnership. Table 17 presents the unstandardized and standardized beta weight coefficients for the variables included in the final model.

Resource Access Achievement

Appendix H shows the results of the bivariate regression analyses for resource access achievement. Seven of the 53 predictors tested were significant at the bivariate level. In the subsequent multiple regression analysis, three of the seven predictors were still significant: the respondent held the rank of associate professor versus a full professor, assistant professor or other position ($B = 0.48$), university resources ($B = 0.60$), and face-to-face meetings occurred at the respondent's university ($B = -0.29$). The latter finding indicates that *not* holding face-to-face meetings at the respondent's university was significantly correlated with resource access. Based on these results, the extent to which the university allotted resources for participation had the greatest effect on the extent to which resources were acquired by the university as a result of partnering. Together, the three predictors explained 65.2% of the variance in resource access achievement. Table 17 presents the unstandardized and standardized beta weight coefficients for the variables included in the final model.

Achievement of Research and Education Improvement

Appendix H shows the results of the bivariate regression analyses for achievement of research and education improvement. Ten of the 53 predictors tested were significant at the bivariate level. In the subsequent multiple regression analysis, two of the ten predictors were still significant: university resources ($B = 0.45$) and operational decision-making ($B = 0.40$), with university resources having a slightly greater effect on the achievement of research and education improvement than operational decision-making. Together, the two predictors explained 39.2% of the variance in achievement of research and education improvement. Table 17 presents the unstandardized and standardized beta weight coefficients for the variables included in the final model.

Achievement of Improvement in Success of Underrepresented Groups

Appendix H shows the results of the bivariate regression analyses for achievement of improvement in success of underrepresented groups. Five of the 53 predictors tested were significant at the bivariate level. In the subsequent multiple regression analysis, two of the five predictors were still significant: the logged total number of students involved from all partner universities ($B = 0.61$), and US citizenship of the PI ($B = 0.31$). The logged total number of students involved from all universities had a greater effect on the achievement of improvement in success of underrepresented groups. These two predictors explained 51.2% of the variance in achievement of improvement in success of underrepresented groups. Table 17 presents the unstandardized and standardized beta weight coefficients for the variables included in the final model.

Qualitative Results

In this section, the major themes are described for each partnership aspect. Qualitative results for the *nature and goals of the partnership*, *university motivation for supporting the partnership* and the respondents' *reasons for partnering again* and *reasons for not partnering again* were discussed earlier, alongside relevant quantitative results. The qualitative results for the remaining partnership aspects are discussed below.

For each question posed, results are presented in a summary table. These tables display the percentage of relevant responses for each PI group. Percentages are based on the number of respondents who answered each question.

Goal Development Process

Table 18 displays the responses of each PI group to the question, *how were the goals for the project developed?* Four major themes emerged: 1) goals collaboratively developed; 2) evolution of goals; 3) goal development influences; and 4) goals not collaboratively developed.

Table 18.

Summary of Qualitative Results for Goal Development

Interview Item							
<i>Item 17. How were the goals for the project developed?</i>							
	HBCU		PWI		PWI2		Total Responders
Total PI Sample	8		8		10		26
Number PIs who answered this question	8		8		10		26
	% of respondents per group (number PIs responding)						% of total responders
Themes	HBCU		PWI		PWI2		
Goals Collaboratively Developed	75.0 (6)		38.0 (3)		60.0 (6)		57.7
Evolution of goals	62.5 (5)		0 (0)		40.0 (4)		34.6
Goal Development Influences	37.5 (3)		38.0 (3)		20.0 (2)		30.7
Goals Not Collaboratively Developed	25.0 (2)		13.0 (1)		20.0 (2)		19.2

Goals Collaboratively / Not Collaboratively Developed

More than half of all respondents reported that their project's goals were developed with the participation of at least two of their partnership's PIs. HBCU and PWI2 PIs said collaboration occurred more often than did PWI PIs (PWI = 38%; PWI2 = 60%; HBCU = 75.0%). In contrast, a few PIs reported that their project's goals were either determined by the

funding agency or developed solely by one PI (PWI = 13.0%; PWI2 = 20.0%; HBCU = 25.0%).

One respondent acknowledged:

“I developed the goals for the project and pulled in other universities to get the job done.” -PWI2 PI

Evolution of Goals

One theme that emerged from PI discussions of goal development was the evolutionary nature of the goals (PWI2 = 40%; HBCU = 62.5%). In some cases, the project itself dictated a change in goals. For example:

“As we started to go through the process, (the partner faculty) realized that some of these goals (the partner faculty) set up were not feasible, and we had to change the goals as we were going along.” -PWI2 PI

Goal Development Influences

Interestingly, in several cases, not only did respondents report goals changed over the course of the partnerships, but also the source of influence of the goals as they were being developed (i.e., versus only input by the partner PIs; PWI2 = 20%; HBCU = 37.5%; PWI = 38.0%). Two example responses are:

“So, with the re-formulation of the project goals, the writing of the proposal was largely done by me and we did this with the assistance of some of the people who were on the advisory committee who submitted a couple of paragraphs here and there.” - HBCU PI

“(involved in goal development meetings) were fairly experienced faculty (from the PWI and the HBCU) and we worked with an experienced project manager and with some folks from (a professional school).” –PWI PI

In summary, three-fourths of HBCU PIs and more than half of PWI2 PIs indicated that goals were collaboratively created. However, only about a third of PWI PIs reported the same. Oddly, the same comparison trend was found in the number of PIs reporting that goals were not collaboratively developed. More HBCU and PWI2 PIs (about a quarter of each group) reported singularly-created goals than did PWI PIs. The evolutionary nature of project goal formation was highlighted by more than half of HBCU PIs and almost half of PWI2 PIs, while no PWI PIs spoke about this aspect. Finally, about a third of HBCU PIs and PWI PIs mentioned sources of influence on goal development, while fewer than a quarter of PWI2 PIs spoke about goal development influences.

Implementation Planning

Table 19 displays the responses of each PI group to the item, *explain what was done to plan for project implementation*. Three major themes emerged: 1) logistics and structure; 2) resource alignment; and 3) solicitation of feedback.

Table 19.

Summary of Qualitative Results for Implementation Planning

Interview Item							
<i>Item 25. Explain what was done to plan for project implementation?</i>							
	HBCU PI		PWI		PWI2		Total responders
Total PI Sample	8		8		10		26
Number PIs who answered this question	8		8		10		26
Themes	% of respondents per group (number PIs responding)						% of total responders
	HBCU PI		PWI		PWI2		
Logistics and structure	75.0	(6)	50	(4)	60.0	(6)	61.5
Resource alignment	62.5	(5)	50	(4)	20.0	(2)	57.7
Solicitation of feedback	62.5	(5)	0.0		0.0		19.2

Logistics and structure

The majority of PIs reported attending to the logistics and structure of their partnerships during the planning implementation stage (PWI = 50.0%; PWI2 = 60.0%; HBCU = 75.0%). Such activities included determining partnership leadership and assigning responsibilities, creating timelines and flow of communication and coordinating activity. One PI explained:

“And there are other issues like this - data sharing, intellectual property, communication- that had to be worked out before we could start, as well as issues like approval processes for the research, dealing with IRBs, animal control and safety boards, things like that.” –PWI2 PI

Resource alignment

Several PIs also noted the activities related to pinpointing and accessing resources (PWI = 50.0%; PWI2 = 60.0%; HBCU = 62.5%). Relevant resources were physical and human and also pertained to university infrastructure. One PI noted his efforts to determine if the project was a “fit” for multiple university programs. He said he determined:

“...what equipment and supplies were necessary, whether the infrastructure, both clinical and computing could accept the project.” –PWI2 PI

Solicitation of feedback

Interestingly, a third theme, solicitation of feedback emerged, but for only one PI group. The majority of HBCU PIs (62.5%) reported consulting sources aside from the partner faculty for input on how to develop their partnerships or developed systems during the planning implementation stage for the sustained evaluation of their programs. In one instance, the PI reported the helpful feedback he obtained:

“I talked to (the dean) and at that point we did not have a dean for the graduate school (at our HBCU). So talking to (the dean) to explain what the (funding agency) goals for the project were and I think the take-home message there was that if we were going to be bringing in students and giving them graduate research assistantships, that we need to be sure to include tuition and health care coverage in the budget because it was indicated to me that there may not be that kind of support from the institution.” –HBCU

PI

In summary, more than half of HBCU PIs and PWI2 PIs and half of PWI PIs noted that planning for implementation required determining the logistics and structure of their partnerships. Similarly, more than half of HBCU PIs and PWI2 PIs and half of PWI PIs emphasized activities in aligning resources. More than half of HBCU PIs reported their efforts in soliciting feedback from partner faculty, program managers and university administration. Interestingly, they were the only group to do so.

Project Implementation Process

Table 20 displays the responses of each PI group to the item, *briefly describe the major activities carried out during the operational stage of the project*. Four major themes emerged: 1) resource alignment; 2) communication among partners; 3) research and technical activities; and 4) partnership administration activities.

Table 20.

Summary of Qualitative Results for Implementation Process

Interview Item							
<i>Item 26. Briefly describe the major activities carried out during the operational stage of the project.</i>							
	HBCU		PWI		PWI2		Total responders
Total PI Sample	8		8		10		26
Number PIs who answered this question	8		8		10		26
	% of respondents per group (number PIs responding)						% of total responders
Themes	HBCU		PWI		PWI2		
Resource Alignment	50.0	(4)	62.5	(5)	20.0	(2)	42.3
Communication among Partners	37.5	(3)	50.0	(4)	30.0	(3)	38.5
Research & Technical Activities	25.0	(2)	25.0	(2)	50.0	(5)	34.6
Partnership Administration Activities	37.5	(3)	25.0	(2)	20.0	(2)	26.9

Resource Alignment

In addition to any alignment of resources that took place during the implementation planning phase, several PIs reported continuing to locate and access resources during the implementation phase of their projects (PWI2=20%; HBCU= 50%; PWI=62.5%). When asked about the major activities of his partnership project, one respondent said that after getting project funding, the next step was determining:

“...these are our target dates for doing this or that task and just making sure that we had all our ducks in a row and all the resources that we needed and then we would just show up and get it done.” -PWI PI

These resources mentioned included physical lab space, research equipment and supplies, and faculty and students hired to carry out the project. Some PIs also mentioned the process of accessing the student and community populations for delivery of programs or interventions:

“From the start we needed to recruit students, so getting informational contact to those students who are currently on our campus s well as getting informational contact out to those who are looking to go to graduate school. And then we have getting the students on board initially, so we provide them with interviews with the advisory board members to determine whether their application is going to be approved.” –HBCU PI

In a couple of instances, respondents explicitly mentioned using existing university structures to broaden the project and advance project goals. For instance, a PI reported:

“What we do is tap into existing mentoring and tutoring activities so that there is a meshing of the two, and the program is becoming a part of what goes on everyday on campus.” –HBCU PI

Communication among Partners

Not surprisingly, many PIs commented on the frequency and modes of communication during the implementation process (PW12=30.0%, HBCU=37.5%; PW1=50.0%). In many instances, communication was mentioned in conjunction with collaborative decision making. For example, one respondent explained:

“We do have substantive discussions trying to figure out how we're going to pay for a post-doc and how we are going to handle PhD students' committees and give direction on what they need to do” –PWI2 PI

Research and Technical Activities

Contrary to expectations that the majority of respondents would highlight the technical aspect of their projects when asked about project implementation, only a few PIs explicitly mentioned the technical activities they had to perform to produce data or a deliverable product (HBCU = 25.0%; PWI = 25.0%, PWI2 = 50.0%). These activities ranged greatly, from developing software algorithms and diagnostic tests for infectious diseases to collecting beef carcass samples and implementing crop management practices.

Partnership administration activities

Some PIs also mentioned attending to partnership administration during the implementation of the project. Most of the administrative activities pertained to efforts to sustain funding or to allocate funding.

“...and then there's turning in the annual progress reports and writing of the competitive renewals.” –HBCU PI

In summary, when reflecting on the project implementation process, on average PIs highlighted the processes of aligning resources and communicating with faculty more often than conducting activities directly related to producing data or attending to the administration of the partnership. Resource alignment was mentioned by at least half of the PIs in the HBCU and

PWI groups, while less than a quarter of PIs in the PWI2 group reported this activity.

Communication was brought out by about a third of the PIs in the HBCU and PWI2 group and half of PIs in the PWI group. Few HBCU and PWI PIs (only a quarter of each group) talked about specific activities related to producing data or a deliverable product during project implementation, while half PWI PIs did so. About a third of HBCU PIs and about a quarter of PWI and PWI2 PIs reported their involvement in partnership administration activities during project implementation.

Partnership Facilitators

Table 21 displays the responses of each PI group to the question, *Briefly describe any factors that helped promote the success of the partnership.*

Table 21.

Summary of Qualitative Results for Facilitators

Interview Item								
<i>Item 40. Briefly describe any factors that helped promote the success of the partnership</i>								
		HBCU		PWI		PWI2		Total Responders
Total PI Sample	Number PIs who answered this question	8		8		10		26
		8		8		10		26
Themes		% of respondents per group (number PIs responding)						% of total responders
		HBCU		PWI		PWI2		
	Interpersonal relationships	87.5	(7)	100.0	(8)	100.0	(10)	96.2
	-Partner commonalities	12.5	(1)	12.5	(1)	20.0	(2)	15.4
	-Enthusiasm and commitment of project stakeholders	50.0	(4)	37.5	(3)	20.0	(2)	34.6
	-Effective teamwork and appropriate balance	12.5	(1)	0	(0)	60.0	(6)	26.9
	-Partner leadership and competence	12.5	(1)	37.5	(3)	10.0	(1)	19.2
	-Previous relationship with partner	0	(0)	37.5	(3)	10.0	(1)	15.4
	Access to resources	25.0	(2)	12.5	(1)	10.0	(1)	15.4
	Program's reputation	25.0	(2)	12.5	(1)	0	(0)	11.5
	Strategies used to reach goals	25.0	(2)	12.5	(1)	0	(0)	11.5

Interpersonal relationships

Almost all PI groups gave various responses indicating that they found the relationships with their partner faculty to be a facilitator of the partnership process (HBCU = 87.5%; PWI = 100%, PWI2 = 100%). Some groups specifically mentioned the commonalities they held with

partner faculty (PWI2 = 20%; HBCU = 12.5%; PWI = 12.5%) including common research interests, common needs, and a common interest in making sure the partnership proceeded smoothly.

“I think it's successful because we have a close relationship between (the other PI) and myself regarding the scientific aspect and common interests. That's probably the main factor that drives this project.” –PWI2 PI

“I think there's a natural interest by both parties to make things work; everyone wants to be sure there are good interactions between (the PWI) and (the HBCU), so if there are rough edges, everyone tries to make sure they are smoothed out right away.” –PWI PI

Some respondents also believed the commitment of their partner faculty was a facilitator (PWI2 = 20.0%; PWI = 37.5%; HBCU= 50.0%). For example, one PI expressed the both partner faculty groups were equally dedicated to their project's goal:

“The faculty are all very committed to the success of the goals for the partnership. At all universities - at (the HBCU) and (the PWI) - all are very committed to increasing the representation of African-Americans at the doctoral level.” –HBCU PI

Effective teamwork and an appropriate balance of power were also reported to be facilitators (PWI2 = 60.0%; HBCU = 12.5%). One PI credits the process of creating a “team culture”:

“So I think that commitment to the building of a team and team maintenance has helped us to work.” –PWI2 PI

Interestingly, one PWI2 respondent stressed that it was important that the balance of power was *appropriate*, rather than necessarily equal.

“...but the balance of power was appropriate because he was the PI and he had the longer standing relationships with this program manger and I didn't want to do anything to mess with that. (The PI) is very innovative and I think that is why program managers like him.” – PWI2 PI

Both HBCU PI and PWI PI groups reported that the leadership and competence of partner faculty played a role in facilitating the partnership (PWI2 = 10.0%; HBCU = 12.5%; PWI = 37.5%).

“I have reliable colleagues over there that we can draw from for a number of things. That wouldn't have happened if we hadn't had this partnership.” –HBCU PI

“The (HBCU partner) researcher himself was a very good guy. He was very knowledgeable.” –PWI PI

Having had a previous relationship with the partner entities was reported to be a partnership facilitator by respondents of all PI groups (PWI = 37.5%, PWI2 = 10.0%). However, PIs referred to their previous interactions with faculty most often.

“I think that the fact that we all knew each other prior to even entering into the partnership. That was a huge part of the success. We knew the limitations that everyone had and we weren't afraid to bring those out and everybody was pretty flexible with each other's shortcomings.” –PWI2 PI

Access to resources

The ability to access resources was perceived as a facilitator by respondents of both the HBCU and PWI groups (HBCU = 25.0%; PWI = 12.5%; PWI2 = 10.0%). In their responses, PIs highlighted the importance of human, financial and physical (e.g., research facilities) resources that were acquired as a result of the partnering. In many cases, the resources accessed were those located at the partner university.

“I think that our research has been tremendously enhanced by partnering with the (PWI partner). They have brought on board the translational components that we couldn't even think about because we don't have a medical school. -HBCUPI

Program's reputation

A small number of PIs emphasized the effect the reputation of their program had on the success of their partnership (PWI = 12.5%; HBCUs = 25.0%). For example, one PI explained the positive feedback loop that existed with his partnership:

“The fact that we have increased the number of African-American students who are participating in research who are now enrolling in graduate school really promotes the success....” –HBCU PI

Strategies to reach goals

Some HBCU PI respondents indicated that the strategies they employed to reach project goals had the concomitant effect of facilitating the partnership process (PWI = 12.5%; HBCU = 25%). For instance:

“Our annual undergraduate research symposium that we have had. There are a half dozen different programs in the state of NC, different partnerships, that we now have an umbrella organization. That umbrella is an organization of all the different PIs of those different programs and it allows us to come together and see what other programs are doing and we can know what is available to our kids. So this allows us to become aware of different avenues of success for the target population”.-PWI PI

In summary, PIs found several factors important to the facilitation of their partnerships. Interpersonal relationships were mentioned the most often by all PIs. In fact, only one HBCU

PI did not bring out this aspect of partnering. Access to resources was reported to be important by a quarter of HBCU PIs and only about a tenth of PWI and PWI2 PIs. The reputation of the program produced by the partnership was salient for partnership facilitation according to a quarter of HBCU PIs and about a tenth of PWI PIs. Similarly, a quarter of HBCU PIs and about a tenth of PWI PIs reported that they found the strategies they used to reach project goals had the dual effect of promoting the partnership process.

Partnership Obstacles

Table 22 displays the responses of each PI group to the question, *Briefly describe any obstacles that were encountered during the life of the partnership*. Four themes emerged that pertained to this aspect of partnering: 1) lack of resources; 2) logistical problems; 3) un-met expectations; and 4) bureaucracy.

Table 22.

Summary of Qualitative Results for Obstacles

Interview Item							
<i>Item 39. Briefly describe any obstacles that were encountered during the life of the partnership.</i>							
	HBCU		PWI		PWI2		Total responders
Total PI Sample	8		8		10		26
Number PIs who answered this question	8		8		10		26
Themes	% of respondents per group (number PIs responding)						% of total responders
	HBCU		PWI		PWI2		
Lack of resources	25.0	(2)	37.5	(3)	50.0	(5)	38.5
Logistical problems	25.0	(2)	37.5	(3)	50.0	(5)	38.5
Un-met expectations	25.0	(2)	25.0	(2)	20.0	(2)	23.1
Bureaucracy	25.0	(2)	12.5	(1)	10.0	(1)	15.4

Lack of Resources

About a third of all respondents (HBCU = 25.0%; PWI = 37.5%; PWI2 = 50.0%) commented that a lack of adequate resources was an obstacle for effective partnering. Such resources included sufficient project staff, enough time to do the project and having enough funding. One PI reflected:

“So maybe it was a little larger project than we had resources to do - man power resources, not necessarily capital within the university, you know, the bench-top technology to do it. It was just we needed technician help.” –PWI2 PI

Logistical Problems

The challenge of coordination was a salient obstacle for some PIs (HBCU = 25.0%; PWI = 37.5% PWI2 = 50.0%). For example, one PI noted:

“So sometimes it is hard to get that many people involved. So there are delays. So sometimes it's like they are waiting for us and we are trying to do something. And we are waiting for somebody else to get some information, so a month can go by before we can get some of these things done. So that is sometimes frustrating when we are trying to do our part, but can't because we are waiting for someone else.” – PWI2 PI

Un-met Expectations

A few respondents expressed their disappointment with those who they felt should have been committed to the project's goals (PWI2 = 20.0%; HBCU = 25.0%; PWI = 25.0%).

Frustrations were expressed in regards to the support PIs expected from their own universities

and in regards to partner faculty performance. One PI expressed her perception of poor partner performance at the partner university level:

“The administration was awful. Basically, they never carry out any task, the transfer of money was awful, the follow through was awful, getting a hold of people was awful. I just would never have anything to do with that administration again.” –PWI PI

Bureaucracy

Bureaucracy with both the university administration and the funding agency provided frustrations for some PIs (PWI2 = 10.0%; PWI = 12.5%; HBCU = 25.0%). When asked if he encountered obstacles and what they were, he noted:

“The partnership itself, no, but the way the funding agency works with us, yes. The funding agency is always late getting the money to us, but when the funds come, we're OK, but when the funds come, they say you have to use these funds between this date and this date. So you have a year, but a lot of times, you don't use it all in a year and you want to carry them over into the next year, which you can do. Unfortunately, on Nov. 30, when the contract ends, we still have \$30,000 we haven't spent that we can't touch until the new funds come in, which will come in sometime this month or next month. Meanwhile, scholarships and buying equipment and paying for students - I can't do anything with it - it's tied up. Now when the new funds come, I'll have new and old funds. And that's the way it is with all the universities.” –HBCU PI

In summary, a lack of adequate resources and logistical problems were both mentioned by half of PWI2 PIs, a third of PWI PIs and a quarter of HBCU PIs. The disappointment brought about by un-met expectations was an obstacle mentioned by roughly a quarter of all PI groups. Bureaucracy was a frustration mentioned by a quarter of HBCU PIs and about a tenth of PWI2 PIs.

Respondent's Personal Benefits from Partnering

Table 23 displays the responses of each PI group to the question, *what have you personally gotten out of participating in this partnership?*

Table 23.

Summary of Qualitative Results for Benefits

Interview Item							
<i>Item 41. What have you personally gotten out of participating in this partnership?</i>							
	HBCU PI		PWI		PWI2		Total responders
Total PI Sample	8		8		10		26
Number PIs who answered this question	8		8		10		26
	% of respondents per group (number PIs responding)						% of total responders
Themes	HBCU PI		PWI		PWI2		
Networking	62.5	(5)	12.5	(1)	50.0	(5)	42.3
Positive outcomes for target population	37.5	(3)	62.5	(5)	20.0	(2)	38.5
Personal and professional development	12.5	(1)	50.0	(4)	50.0	(5)	34.6
Access to resources	12.5	(1)	12.5	(1)	50.0	(5)	23.1

Networking

Several respondents reported the opportunity to network with others in the STEM field and to exchange knowledge with them was a major benefit of partnering (PWI = 12.5%; PWI2 = 50.0%; HBCU = 62.5%). One PI commented:

“I’ve gotten a lot. I’ve worked with a lot of good and smart people and I find that very stimulating.” –PWI2 PI

Positive outcomes for target population

Some respondents listed benefits that were altruistic in nature. For them, the major benefit was being a part of a team that contributed to the goals of another population (PWI2 = 20.0%; HBCU = 37.5%; PWI = 62.5%). One PI explained:

“My reward has been the extent to which I have been able to facilitate the different program activities that serve the population - these kids here. Without the funding for the scholarships, the summer bridge, I would have to go someplace else to try to find it. My personal satisfaction comes from knowing I’ve made a difference and we’ve been able to do some things that positively impact the minority students in this curriculum.”
–PWI PI

Professional and personal development

Respondents also expressed that they experienced professional and personal development as a result of participating in their partnerships (HBCU = 12.5%; PWI = 50.0%; PWI2 = 50.0%). Examples of gains included learning how to participate in and manage large

research partnerships and a broader understanding of various research fields. One PI commented:

“This was a project that brought together a number of things that I had worked on in the past and it has empowered me to kind of think about those things differently. So, it was very stimulating intellectually.” – PWI2 PI

Access to resources

A few respondents noted that they benefited from participating in the partnership because they were able to access more resources (HBCU = 12.5%; PWI = 12.5%; PWI2 = 50.0%). Increased access to funding was mentioned most often. However, one PWI PI explained the benefit in terms of augmenting existing resources by simply stating, *“I think this is a great way to expand my resources.”*

In summary, at least half of HBCU PIs and PWI2 PIs remarked that networking was a significant benefit of partnering, while only about a tenth of PWI PIs mentioned the same. More than half of PWI PIs reported receiving the benefit of contributing positively to a target population, while only about a third of HBCU PIs and fewer than a quarter of PWI2 PIs mentioned this outcome. Personal and professional development was a benefit reported by half of PWI and PWI2 PIs, while only about a tenth of HBCU PIs reported this benefit. Half of PWI2 PIs reported benefiting from increased access to resources, while only about a tenth of HBCU and PWI PIs mentioned this benefit.

Discussion

The education and research training of underrepresented groups is an increasingly important factor in maintaining a strong and competitive national S&E workforce. Research partnerships between HBCUs and PWIs present an opportunity for strengthening research training and the educational pipeline for African-American students. In some instances, HBCU-PWI partnerships also increase PWIs access to a pool of talented underrepresented STEM students. Several factors are salient for the success of these partnerships. Investigators of inter-organizational collaborations assert that the alignment of resources (Adessa & Sonnenwald, in press), the building of positive relationships among collaborators (Chompalov & Shrum, 1999; Davenport et al., 1999; Vengen & Hexham, 2003), and the structure of the collaboration (Davenport et al., 1999) are among the factors that influence perceived success and satisfaction of collaborators. However, there is a gap in research that assesses the specific types of collaborations formed between HBCU and PWI researchers in the STEM fields; in fact, only two case studies have been conducted on HBCU-PWI partnerships (Adessa & Sonnenwald, in press; Weston et al., 2005).

Aside from the potential benefits for African-American students and the national workforce, HBCU-PWI partnerships are also assumed to be effective in contributing to the building of HBCU infrastructure (Tanaka & Gladney, 1993). Conversely, some HBCU collaborators have reported circumstances within their partnerships that are challenges to effective teamwork (Federal Demonstration Partnership Membership Standing Committee, 2003). There has not been research, however, to support such assumptions and assertions regarding HBCU-PWI partnerships.

There is a need to understand the basic characterizations of HBCU-PWI partnerships. Even within the STEM disciplines, the formation and progression of these partnerships vary greatly and those differences have the potential to affect partnership outcomes. This study was the first empirical study to explore the varying structures, processes and outcomes of multiple HBCU-PWI partnerships. Also, it made comparisons among descriptive data provided by research PIs from HBCUs and PWIs who were involved in HBCU-PWI partnerships and data provided by PIs from PWIs who were involved in PWI-PWI partnerships. Finally, it attempted to identify which factors significantly contribute to the variance in partnership outcomes: collaborator satisfaction with the project and the partnership, perceptions of partnership success, collaborator willingness to participate in a similar partnership again and the achievement of university goals.

Major Results

PI Response Comparisons

Partnership nature and goals. Based on a qualitative analysis of PIs' descriptions of their partnership projects, the nature of their projects varied greatly in terms of the major field of research, the level of student involvement, the classification of students involved (i.e., undergraduate vs. graduate), and the formally stated goals. Surprisingly, the majority of the PIs sampled were participants in partnerships that had more than two partners. In fact, on average, partnerships were alliances of four to five institutional partners. Although more of the HBCU PIs interviewed were affiliated with the lead partner institution than the PWI and PWI2 PIs sampled, the frequencies were not significantly different.

However, the results of this study produced a noteworthy trend. Both HBCU and PWI PIs rated three aspects of their partnership projects more highly than did PWI2s: 1) the research

training of undergraduate and graduate students; 2) the development of curriculum; and 3) the research training or education of underrepresented groups. Although no data was collected to make distinctions between graduate and undergraduate training, HBCU responses to open ended questions suggested the low availability of graduate programs at their institutions, hinting that the majority of student training that occurs at HBCUs as a result of HBCU-PWI partnerships is done at the undergraduate level.

Though all PIs reported that research was an important aspect of their partnership projects, infrastructure development and strengthening of the educational pipeline were mentioned more often by HBCU PIs than PWI and PWI2 PIs, suggesting that HBCU PIs may perceive the main goal of HBCU-PWI partnerships as serving HBCU institutions by promoting university and student development more so than PWIs involved in HBCU-PWI partnerships. However, these findings also could be a result of partnership selection, such that the HBCU PIs sampled were actually involved in partnerships with explicit goals of institutional and educational development more than were the PWI PIs sampled.

This study found that the HBCU PIs had a significantly higher average total number of involved faculty across partner universities than both PWI and PWI2 PIs. Also, the partnerships of HBCU PIs had a higher average total number of students involved across partner universities. HBCU PIs also reported a significantly higher involvement of students *within* their institutions than PWI or PWI2 PIs. Unfortunately, due to a paucity of data, this study is not able to make conclusions that compare the ethnicity of students involved in HBCU-PWI and those involved in PWI-PWI partnerships. However, these findings suggest that, due to a greater involvement of these groups, faculty and students participating in HBCU-PWI

partnerships have a greater opportunity for resource and knowledge exchange than those participating in PWI-PWI partnerships.

Results of this study also suggest that the faculty of HBCUs are capitalizing on the opportunities for knowledge exchange. The frequency of communication among partner faculty reported by HBCU and PWI PIs was found to be similar to that reported by PWI2 PIs. Thus, these findings suggest that the partnerships sampled are functioning in a manner that supports the building of HBCU infrastructure through knowledge exchange.

Power and Resource Inequalities. According to past literature, HBCU participants in HBCU-PWI partnerships have noted a sense of imbalances in power and have reported feeling that PWI faculty regard them as “tokens” for the sake of increased chances of funding and as sub-standard partners (Federal Demonstration Partnership Membership Standing Committee, 2003). This belief does not seem to be supported by the findings of the current research. Based on the findings of this study, on average, HBCU partners were as likely to fulfill multiple roles, participate in decision makings at both the planning and operational stages of their projects, and to rate partner equality highly. Furthermore, ratings of partner capability were high across all PI groups, but no significant differences were found among any of the groups, indicating that PWI and PWI2 PIs have a similar high regard for their partners.

Despite assertions in the past literature concerning the inequalities in resources among partners in HBCU-PWI partnerships, results of this study show that HBCU partners received a percentage of partnership funding similar to that of their PWI counterparts who were involved in the same type of partnerships. In fact, significant differences in the percentage of funding allotted were found only between the PWI and PWI2 groups, with the PWI group reporting an average of twice as much funding as PWI2s. Moreover, the HBCU group and both PWI groups

gave similar ratings of perceptions of partner equality, indicating that they believed their partnerships to be characterized both by a fair allocation of funding and a balance of power between the two universities.

On average, HBCU PIs also reported receiving university resources for participating in their partnerships to a significantly greater extent than did PWI2 PIs. This result underlines the importance of HBCU-PWI partnerships as a mechanism for building research infrastructure within HBCUs. On the surface, it may appear that these results are in conflict and may disqualify any HBCU PI concerns about not having enough resources for partnering. However, in response to open-ended interview items, two HBCU PIs remarked that a lack of adequate resources at the faculty level was an obstacle in the partnership process. Thus, it is worth mentioning again that the HBCU PIs sampled tended to be involved in partnerships that have a large number of students and faculty, which requiring a large amount of administrative resources. Also noteworthy is that many HBCUs have a lower infrastructure capacity for doing research than many PWIs have. Thus, though HBCU PIs may receive more university support than PWI PIs as a result of doing partnership projects, the total level of support obtained by HBCU PIs still may not be what is ultimately needed to perform quality research. In other words, the initial discrepancies between resources available to HBCU and PWI faculty may preclude any significant benefits to increasing resources for the HBCU PI. For instance, the course load of HBCU faculty can be three times as high as that of PWI faculty; therefore, the reduction in course load for a HBCU PI would have to be significant to allow for the same amount of time for doing research that a PWI PI might have.

Motivation. One concern raised by observers was that partnerships between HBCUs and PWIs are formed because an upper-level administrator dictates the alliance. The data did

not support this assumption. Very few PIs said that the partnership was formed because university administrators or the funding agency required a partnership. Almost a third of PWI2 PIs, and at least half of PWI and HBCU PIs reported that they participated in the partnership because they co-conceived of the partnership project (i.e., with the partner PI). In fact, based on the qualitative analysis, a third of all PIs reported that their university administration had nothing to do with the decision to partner. Instead, about a third of the PIs report their perception that the nature of the project or the nature of the funding agency's solicitation provided motivation for partnering at the university level. These finding suggests that instead of partnerships forming most often due to top-down process, networking among HBCU and PWI PIs is the basis for HBCU-PWI alliances.

Partnership Outcomes

Given literature containing anecdotal information (Federal Demonstration Partnership Membership Standing Committee, 2003), HBCU PIs were expected to rate their satisfaction and perceptions of success lower than the other two PI groups. Contrary to expectations, PI ratings of satisfaction with the project outcomes, of satisfaction with the partnership process, of perceptions of partnership success and of willingness to participate again in a similar partnership were similar for all PI groups. However, one outcome, the degree to which the partnership contributed to the improvement in the success of underrepresented groups was rated more highly by HBCU and PWI PI groups than by the PWI2 group. Again, this finding supports the importance of HBCU-PWI partnerships in supporting African-American students involved in STEM research and education.

Brinkerhoff's Framework for Partnership Evaluation

A great deal of this study's predictive analyses were based on a model developed by Brinkerhoff (2002; see Figure 1). Although the survey instrument used in this study does not quantitatively assess all the variables Brinkerhoff gleaned from the literature as salient to partnership evaluation (e.g., initial degree of PI motivation to partner, contractual agreements, transparency, partner willingness to adapt operations and procedures for the sake of the partnership), the instrument does measure at least one of the variables that comprise each of the framework's five areas of assessment. Specifically, one of the *prerequisite and success factors in partnership relationships*, compatibility, is measured as the extent to which PIs knew partner faculty before partnering. Several measures evaluated the *degree of partnership practice*. They included measures of a) the total funding allotted to partners, b) perceptions of fairness of this allocation, c) the number of faculty and students involved from each partner university, d) the number of roles PIs performed in their partnerships, e) the degree of PI involvement in decision making during planning and operational stages of the partnership, f) partner equality and g) location of face-to-face meetings. *Partner performance* is assessed using the partner capability scale, which was created from two items measuring partner faculty and partner administrator competence. Brinkerhoff's *success factors and efficiency* area of assessment is evaluated using the scale of university resources that measures the degree to which institutions allotted resources to PIs for their participation in partnerships. The *outcomes of the partnership relationship* are assessed in terms of a) PI willingness to participate again in similar partnerships, b) PI satisfaction with project outcomes, c) PI satisfaction with partnership processes, d) PI perceptions of partnership success, and e) the achievement of partner university goals through participation in the partnership.

This study's findings suggest support for Brinkerhoff's assertions regarding the direct linkages between the major areas of partnership assessment and *partnership outcomes*. For example, partner capability and the location of face-to-face meetings, which represents Brinkerhoff's *partner performance* and *degree of partnership practice* areas of the framework respectively, were found to predict both the two major partnership outcomes, willingness to participate in a similar partnership again and perceptions of partnership success.

Also in support of the framework, this study shows that having previously known the partner faculty, a measure of compatibility (i.e., one of the *prerequisite and success factors*), and partner equality, were significant predictors of the outcome, PI satisfaction with partnership processes. Also, the degree to which PIs' universities made arrangements for their participation in the partnership, which measures *success factors and efficiency*, is an important predictor for the partnerships' contributions to the achievement of universities' goals of accessing more resources (i.e., human and physical), as well as for the partnerships' contributions to the achievement of universities' goals of improving research and education.

However, because of limited sample size and other constraints, the current study could not detect intermediary linkages between *prerequisites and success factors* and *partnership outcomes*. That is, this study could not affirm that any measure of *degree of partnership practice* acts as a mediator between compatibility and any partnership outcome; nor were analyses done to confirm that partner capability mediates the relationship between compatibility and degree of partnership practice, as Brinkerhoff suggests. Also, this study did not assess the moderating effect of the degree to which PIs' universities made arrangements for their participation in the partnership on *partner performance* and *degree of partnership practice* in

predicting *partnership outcomes*. These issues will have to be left to future studies.

Insights from Qualitative Analyses

The responses to the open-ended questions provide insight regarding the importance of resources in inter-university partnering. Access to resources was cited as a salient feature in PIs' (i.e., all PI groups) willingness to participate in future partnerships, and was a significant facilitator and benefit for some of the PIs interviewed. Respondents also reported that the alignment of resources was a key activity at both the implementation planning and during the actual implementation of the partnership project. The lack of adequate resources for achieving project goals, however, was the obstacle for efficient partnering mentioned most often by all respondents. A lack of adequate resources was also relevant for PIs' unwillingness to participate in future partnerships.

Interestingly, the analysis of open-ended responses also revealed one difference between PI groups: the prevalence of solicitation of feedback for HBCU PIs involved in HBCU-PWI partnerships. This activity was not mentioned by PWI or PWI2 groups, suggesting that HBCU PIs are actively seeking support for their partnerships from more experienced faculty and agency project managers. Similarly, when speaking about the development of project goals, HBCU PIs reported developing goals in collaboration and their sources of influence in the development of project goals more often than either PWI or PWI2 PIs. These results may be an indicator of the lack of experience HBCU PIs have in participating in partnerships and in conducting research projects or both.

Interpersonal relationships also emerged as an extremely important factor in the facilitation of partnership processes. In fact, only one PI failed to mention this aspect of

partnering. These results support past literature that suggests that partner commonalities, an appropriate balance of power, and trust related to partner competence and previous partner relationships are salient for effective partnering. Adding to the literature, this study has found that the PIs regard enthusiasm and commitment of project stakeholders also as key features of successful partnering.

Methodological Issues and Limitations

This study has a few notable limitations. The decision to collect data through structured telephone interviews instead of paper surveys was likely the correct choice for data collection. Almost every open-ended item was answered, allowing for a high response rate for qualitative analyses. Also, several respondents used the opportunity to clarify items with the interviewer before responding. However, respondents were made aware that the interview was being recorded. Even though confidentiality was guaranteed, there is a possibility that respondents tended to give less-than-candid answers. Thus, this study would have benefited from a triangulation method of investigation, whereby more than one participant in each of the partnerships would have been interviewed, and a consensus on responses could have been determined.

This study assessed several inter-university partnerships versus the single inter-university partnership assessed in each of the case studies of past research. Nonetheless, sampling in the current study could be improved. Due to specific sampling criteria and the variation in the partnerships themselves, fewer than 30 respondents provided sufficient data. Although probability thresholds were raised to increase power, a larger sample also would have provided more power for predictive analyses. A small sample size also rendered the data unsuitable for detecting moderator variables. Another limitation is that the sample was taken

from one geographic area. The results of this study would have been more generalizable if a national sample had been acquired. Also, the reliability of the data on HBCU-PWI and PWI-PWI partnerships would have been increased if responses had been elicited from the PIs of both sides of each partnership. Finally, the partner capability and the resource access achievement scales that were used had low reliability coefficients.

Future Directions

This study was exploratory and has provided groundwork for numerous future studies. It has revealed the variation in HBCU-PWI partnerships and thus indicates some of the ways in which HBCU-PWI partnerships can be classified. For instance, partnership categories could be made based on the distance between partner universities, goals of the partnership (i.e., research or education), the degree involved students are pursuing, the number of university partners, the main field of research, the inter-disciplinary nature of partnerships, and the length of time the partnership has been in existence. Thus, not only should potential research examine an even greater number of HBCU-PWI partnerships, but also should endeavor to conduct subsequent comparative and predictive analyses based on any of the possible categorization schemes.

It is worth mentioning that the goals of HBCU-PWI partnerships are not always formally stated as increasing the numbers of African-American participants in STEM disciplines or as building HBCU infrastructure; conceivably, researchers who decide to continue participating in HBCU-PWI partnerships might design such goals for future partnerships. Thus, arguably the most important outcome assessed in the current study is the willingness of researchers to participate in similar partnerships again. Though no significant differences were found in this study for this particular outcome, given the support this study has shown for the importance of HBCU-PWI partnerships in infrastructure-building and research

training of underrepresented groups, PI willingness to participate again in similar partnerships should be included in future studies of HBCU-PWI partnerships. Finally, future research should use and build on the measures developed for this study.

Implications

The findings of this study have implications for policies regarding the creation and implementation of partnerships between HBCUs and PWIs. The qualitative and quantitative findings combine to suggest the importance of fostering positive interactions and opportunities for networking among partnering faculty. Also, the qualitative findings of this study show the importance of resource alignment throughout the partnership. Therefore, partnership administrators should create a partnership environment that promotes flexibility and understanding among partners as resources are being acquired, as well as understand the environment within which the partnership exists so that resources are acquired with the minimal use of existing resources. Based on study outcomes showing that previously knowing one's partner is salient to partnership outcomes, partnering universities should increase the engagement of junior faculty, so that they interact with other potential partner faculty thereby increasing the chances that future partnerships are formed between faculty who already have a knowledge of each other. Study results suggest that rather than forcing partnerships between HBCU and PWI faculty, agencies funding HBCU-PWI partnerships should offer an increase funding for those partnerships.

Finally, this study's findings have implications for national policies. As explained, this study supports the suggestion that HBCU-PWI partnerships are effective for engaging HBCU faculty and students in research and for building HBCU infrastructure. Yet, the

current resources available to HBCU PIs in these partnerships appears to be inadequate for their research and administrative activities. Thus, federal policies for research should include an increase in funding for HBCU-PWI partnerships and should support research to better understand the appropriate allocation of funding among university partners.

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Appendices

Appendix A: Review of Major Partnership Dimensions from Literature

MOTIVATION		
FOCAL COLLABORATION TYPE	Inter-organizational	
AUTHOR(S)	Barringer & Harrison, 2000	
LEVEL OF ANALYSIS	Organizational	
FINDINGS/THEORY	Motivational Theories:	* Strategic Choice Theory
		* Stakeholder Theory
		* Resource Dependence Theory
		* Transaction Costs Economics Theory
		* Institutional Theory
	Absorptive Learning Theory	

PROCESS					
FOCAL COLLABORATION TYPE	University Scientific Collaboratory (one class)	Inter-Orngaizational	Inter-university, Educational	Inter-University, Research	Inter-organizational, Geographically-dispersed
AUTHOR(S)	Sonnenwald et al., 2002	Vangen & Huxham, 2003	Weston & McMillan, 2004	Adessa & Sonnenwald, 2003	Cramton, 2002
LEVEL OF ANALYSIS	Group	Group	Inter-organizational	Inter-organizational	Inter-organizational
FINDINGS/THEORY	Collaborating remotely before collaborating face-to-face may be beneficial in technology-assisted scientific collaboratories.	Trust-building among collaborators improves inter-organizational relationships.	Quality and style of communication technology influences ability of participating students to discuss issues salient to the collaboration itself; designing curriculum around goals and faculty professional development for partnering would postively affect partnership outcomes; faculty workloads and class scheduling impact partnership outcomes.	Planning to align resources guides collaboration towards success.	Communication is a micro-process that affects the ability of the partners to build trustful relationships.

STRUCTURE					
FOCAL COLLABORATION TYPE	Inter-University Scientific Collaboratory	Inter-University Scientific Collaboratory	Inter-organizational	Multi-institutional, Scientific	Inter-organizational, R&D
AUTHOR(S)	Hara et al., 2003	Hara et al., 2003	Huxham, 2000	Chompalov et al., 2002	Davenport et al., 1999
LEVEL OF ANALYSIS	Individual	Group	Inter-organizational	Inter-organizational	Inter-organizational
FINDINGS/THEORY	The effects of person-level motivation, work style, writing style and priority, personality, and approach to science on collaboration depends on the structure of the collaboration.	Quality of linkages among collaborators in teams affects quality of the partnership.	Theory: Power, leadership trust and membership structure affect partnership outcomes.	Scientific collaborations can be characterized according to partnership formalization, hierarchy, scientific leadership and division of labor.	Third party management external to a collaboration can affect the progress of that collaboration and the creation of further partnerships among the collaborators.

Appendix B: Letter of Invitation

Dear Colleague:

According to the (university) System database, you are currently or have recently been involved in an externally-funded, **multi-university** research or educational project. Denis Gray, Professor of Psychology at N.C. State University, is conducting a National Science Foundation-funded study of such collaborative partnerships. As Professor Gray's follow-up communication will explain, this study is designed to help understand the factors that promote and impede successful multi-university partnerships.

Over the past decade or more, funding agencies have recognized the significant value provided by multi-university research and educational partnerships, including partnerships between large research universities and smaller institutions, and have demonstrated an increased commitment to funding these activities. Like these funding agencies, the (university system's general administration) is very supportive of this trend and is committed to finding ways to make these partnerships as effective as possible. Therefore, I would like to request that you cooperate with Dr. Gray when he contacts you in the near future. I understand he might be contacting you by telephone, and hopefully this letter will serve as an initial introduction to his interest in conducting such a study.

If you have any questions, please do not hesitate to contact Dr. Gray directly (denis_gray@ncsu.edu; 919-515-1721). Thank you for your kind attention to this request.

Sincerely,

XXXXXXXXX

Vice President for Research and Sponsored Programs

Appendix C: Inter-University Partnership Screening Protocol

“You are being asked to respond to this survey because of your participation in an externally-funded project that involves an inter-university partnership. This survey contains questions that ask you about your experience and perceptions of that partnership and the partnership project. The project that you should refer to as you answer this questionnaire should either be currently funded or have had funding that ended no earlier than January 1, 2005.”

Screening Questions

- 1) *Are you or have you been involved in a partnership project titled _____*
(give name based on our records)?
 - a) *Yes* (ask Q2)
 - b) *No* (clarify by asking Q4 and if true terminate interview)

- 2) *Is this project younger than 6 months old?*
 - a) *Yes* (terminate interview)
 - b) *No* (ask Q3)

- 3) *What is the current status of this project?*
 - a) *The project hasn't started yet* (terminate interview)
 - b) *The project is still operating* (ask Q4)
 - c) *The project has ended* (Specify when. If partnership ended before January 1, 2005, terminate interview. If partnership ended after January 1, 2005, ask Q4)

- 4) *We want to talk to someone at your university who is pretty familiar with both the development of the project and its day-to-day operations. Are you the best person to talk to?*
 - a) *Yes* (continue interview)
 - b) *No* (try to clarify who would be the best person and decide whether or not to continue the interview)

Appendix D: Verbal Informed Consent and Acknowledgement of Recording Script

Investigation of Inter-University Partnerships

After introductions: “You should have received an informed consent form for research electronically that was sent to you on _____ (date).”

“Did you receive, read and understand that information?”

(If not read) – “Please take a moment to read that information now.”

(If not understood) – “What questions can I answer for you about that form?”

(If not received) – “Maybe I don’t have your correct e-mail address. Can you give that to me so that I can try to send it again to you now?”

(If yes) – “Great. Quickly, I’d like to reiterate that your responses to the questions I ask you will be audio-recorded. The information from the recordings and any notes and written data from the recordings will be kept strictly confidential. All audio-recorded data will be retained for six months, and it will be stored securely on a password-protected personal computer that resides in a locked office; files of audio-recorded data will be maintained separately from files containing information that identifies participants. After a period of six months, all audio-recorded data will be destroyed. You may request that I don’t audio-record the interview. Either way, no reference will be made in oral or written reports which could link you to the study; all data will be reported in aggregate form. Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty.”

“If you consent to participate in this study, please provide verbal agreement to the following statement: ‘I have read and understand information in the consent form sent to me by e-mail on _____ (date) . I agree to participate in this study with the understanding that I may withdraw at any time.’”

I attest that _____ has consented to participate in this study. (participant name)

(Signature of Principal Investigator)

Appendix E: PowerPoint Slides for Telephone-Administered Survey

Inter-University Partnerships

A Telephone-administered Survey

Andrea Lloyd
Psychology Department
North Carolina State University

1

- **Could you briefly describe for me the nature and goals of the project?**

- **How important were the following to your partnership project:**

	Not at all important (1)	Slightly important (2)	Somewhat important (3)	Quite important (4)	Very important (5)
Research and/or knowledge creation					
Research training of undergraduate and graduate students					
The development of curriculum					
The research training or education of underrepresented groups					
Other (specify)					

Basic Partnership Information

2

- What other universities received funding for this partnership?

- Including your own university, approximately what percentage of the total funding did the various university partners receive for participating in this partnership?
 - My university _____%
 - Partner university 1 _____%
 - Partner university 2 _____%
 - Partner university 3 _____%
 - I don't know

Basic Partnership Information

3

- Which institution was considered the "lead" institution?

- Approximately how many faculty members were involved in the project at each institution?
 - My university _____
 - Partner university 1 _____
 - Partner university 2 _____
 - Partner university 3 _____
 - I don't know

- To the best of your knowledge, during the most current grant year, approximately how many total students were involved in the project from all partner universities?

- To the best of your knowledge, during the most current grant year, approximately how many students were involved in the project from your university?

Basic Partnership Information

4

- **To the best of your knowledge, during the most current grant year, approximately what percentage of the number of students from your university who are involved in the project are:**
 - Non-US citizens _____
 - US citizens _____
 - I don't know

- **During the most current grant year, of the students from your university who are US citizens, approximately what percentage of them are:**
 - Black _____
 - White _____
 - Asian-American _____
 - Hispanic-American (not of African descent) _____
 - American Indian/Alaskan Native _____
 - I don't know

Basic Partnership Information

5

- **Who first conceived of this partnership-based project?** (select one)
 - A. It was my idea
 - B. Faculty at my university (excluding yourself)
 - C. Faculty at a partner university
 - D. It was a joint idea between me and the other partner PI(s)
 - E. An administrator at a partner university
 - F. An administrator at my university
 - G. It was a joint idea between administrators at my and another partner university
 - H. I don't know
 - I. Other (please explain)

Basic Partnership Information

6

■ **Why did you decide to participate in this partnership?**

(select one)

- A. It was my idea
- B. I was assigned to do it by an administrator
- C. I was asked to do it by an administrator and I accepted
- D. I was asked to do it by a colleague at my university and I accepted
- E. I was asked to do it by a colleague at a partner university and I accepted
- F. Other (please explain)

Basic Partnership Information

7

■ **To what extent did your institution make the following arrangements for you to work on this project?**

	No extent (1)	A small extent (2)	A moderate extent (3)	A large extent (4)	A very large extent (5)	Not applicable (0)
Reduction in my course load						
Increased technology to support my contribution to the project						
Increased administrative assistance						
Funding for partnership project related travel						
Release time						
Other (specify)						

Basic Partnership Information

8

- **In your opinion, what motivated your university to support a partnership instead of pursuing the project alone?**

- **When did you first become involved in this partnership?**
 - A. During the project planning stage
 - B. During the operational stage

- **What formal role(s) did you fulfill for this project?** (multiple answers possible)
 - A. Writing the proposal for the project
 - B. Leading activities for planning the implementation of the project
 - C. Managing the overall project
 - D. Managing the project on my campus
 - E. Conducting research
 - F. Supervising students
 - G. Providing extension assistance
 - H. Writing of publications and reports
 - I. Other (please note)

Basic Partnership Information

9

- **How were the goals for the project developed (i.e., what was the process)?**

- **To what extent did you contribute to decisions made during the following activities?**

	Not at all (1)	A small extent (2)	A moderate extent (3)	A large extent (4)	A very large extent (5)
Conceptualizing the project					
Formulation of project goals					
Writing the proposal for the project					
Planning for the implementation of the project					

Project Planning

10

- **Approximately how many months passed from the time this project was conceived until it was initiated?**

- **How many times did you communicate face-to-face with faculty from the other partner university during the planning stages?**

- **In that time how often did you communicate by e-mail with faculty from the partner university?**
 - 1) once
 - 2) at least every other month
 - 3) at least once a month
 - 4) at least once a week
 - 5) almost daily

Project Planning

11

- **How many times did you communicate face-to-face with other faculty members *from your university* who participated in the partnership during the planning stage?**

- **How often did you communicate by e-mail with the other faculty members from your university who participated in the partnership during the planning stage?**
 - 1) once
 - 2) at least every other month
 - 3) at least once a month
 - 4) at least once a week
 - 5) almost daily

Project Planning

12

- **After the proposal was approved, how much time was spent planning for the actual implementation of the project?**

- 1) almost none
- 2) a couple of hours
- 3) a day or two
- 4) several days
- 5) a week or more

- **Explain what was done to plan for project implementation.**

Project Planning

13

- **Briefly describe the major activities carried out during the operational stage of the project.**
- **To what extent did you contribute to decisions made during the following activities?**

	No extent (1)	A small extent (2)	A moderate extent (3)	A large extent (4)	A very large extent (5)
Managing the overall project					
Managing the project on my campus					
Carrying out the project's main activities (including conducting project research, curriculum development and teaching curriculum)					
Writing of publications and report					
Supervising graduate student research					
Supervising or teaching undergraduates					
Providing extension assistance					

Project Operation

14

- **During the typical semester, how often did you communicate face-to-face with faculty *from the other partner university* during the operational stage of the partnership?**

- 1) once
- 2) at least every other month
- 3) at least once a month
- 4) at least once a week
- 5) almost daily

- **During the typical semester, how often did you communicate by e-mail with faculty from the partner university?**

- 1) once
- 2) at least every other month
- 3) at least once a month
- 4) at least once a week
- 5) almost daily

Project Operation

15

- **During the typical semester, how often did you communicate face-to-face with other faculty members *from your university* who participated in the partnership during the operational stage?**

- 1) once
- 2) at least every other month
- 3) at least once a month
- 4) at least once a week
- 5) almost daily

- **During the typical semester, how often did you communicate by e-mail with other faculty members from your university who participated in the partnership during the operational stage?**

- 1) once
- 2) at least every other month
- 3) at least once a month
- 4) at least once a week
- 5) almost daily

Project Operation

16

- **Thinking about the entire life of the project, when communicating face-to-face with faculty from the partner university, where did you meet?**
 - A. On my university's campus
 - B. At the campus of the other partner university(s)
 - C. At a neutral meeting place, meaning at none of the partner universities' campuses
 - D. The location for pre-planning meetings altered among all the partner universities, including my campus
 - E. We never met face-to-face

- **To what extent did you know the faculty involved in the project from the partner university before the project was conceived?**
 - 1) no extent
 - 2) a small extent
 - 3) a moderate extent
 - 4) a large extent
 - 5) a very large extent

Project Operation

17

•How satisfied are you with the following partnership processes?

	Very dissatisfied (1)	Quite dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Quite satisfied (4)	Very satisfied (5)
Activities related to the development of project goals					
The amount of involvement you were allowed in making decisions for the project					
Amount of time spent planning for project implementation					
The project-specific activities done during the operational stage					
Communication frequency among all partners					
Methods of communicating with all partners					
Communication frequency within my university					
The allocation of university resources that I needed					

Overall Evaluation

18

•This partnership has been characterized by:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Not applicable (0)
A close working relationship with faculty members from the partner university						
A balance of power between my university and the partner university						
Capable administrators at the partner university						
Competent faculty members from the partner university						
Fair allocation of funding to my university for my participation in this project						

Overall Evaluation

19

■ **I would be willing to participate in another partnership of this type.**

- 1) strongly disagree
- 2) disagree
- 3) neither disagree nor agree
- 4) agree
- 5) strongly agree

■ **Why or why not would you be willing to partner again?**

Overall Evaluation

20

•In your opinion, to what extent were the following university-level goals achieved by your institution's participation in this partnership?

	No extent (1)	A small extent (2)	A moderate extent (3)	A large extent (4)	A very large extent (5)	Not applicable (0)
Increased access to tangible resources (i.e., funding, lab space, classroom space, lab equipment)						
Increased access to human resources (e.g., knowledge exchange)						
Increased certainty that stakeholders (i.e., project beneficiaries and project funding source) will be satisfied with the partnership and the project						
An improvement in quality research and educational programming for my academic department						
An improvement in my institution's reputation for participating in partnership projects of this type						
An improvement in the rate and success of underrepresented groups						
Other (specify)						

Overall Evaluation 21

- **Briefly describe any obstacles that were encountered during the life of the partnership.**

- **Briefly describe any factors that helped promote the success of the partnership.**

- **What did you personally get out of participating in this partnership?**

Overall Evaluation 22

■ **In your opinion, how successful was this partnership?**

- 1) not at all successful
- 2) slightly successful
- 3) somewhat successful
- 4) quite successful
- 5) very successful

■ **Overall, how satisfied are you with the outcomes of this project?**

- 1) very dissatisfied
- 2) quite dissatisfied
- 3) neither dissatisfied nor satisfied
- 4) quite satisfied
- 5) very satisfied

Overall Evaluation

23

■ **What is your gender?**

■ **What is your faculty rank?**

- 1) Assistant Professor
- 2) Associate Professor
- 3) Full Professor
- 4) Other _____ (specify)

■ **Are you tenured?**

■ **If no, are you in a tenure-track position?**

Principal Investigator Descriptors

24

- **What university department do you represent?**
- **Do you have any administrative responsibilities?**
- **Are you a US citizen?**
- **What is your ethnicity?**
 - A. Black
 - B. White
 - C. Asian-American
 - D. Hispanic-American (not of African descent)
 - E. American Indian/Alaskan Native
 - F. Multiple ethnicities

Principal Investigator Descriptors

Appendix F: Inter-University Partnership Interview Protocol

I. Basic Partnership Information

- 1) *Could you briefly describe for me the nature and goals of the project?*
- 2) *How important were the following to your partnership project:*
Scale: 1= not at all important, 2=slightly important, 3=somewhat important, 4 =quite important, 5 =very important
 - a) *Research and/or knowledge creation*
 - b) *Research training of undergraduate and graduate students*
 - c) *The development of curriculum*
 - d) *The research training or education of underrepresented groups*
 - e) *Other _____ (specify)*
- 3) *What other universities received funding for this partnership?*
- 4) *Including your own university, approximately what percentage of the total funding did the various university partners receive for participating in this partnership?*
 - a) *Your university _____%*
 - b) *Partner university 1 _____%*
 - c) *Partner university 2 _____%*
 - d) *Partner university 3 _____%*
 - e) *I don't know*
- 5) *Which institution was considered the "lead" institution?*
- 6) *Approximately how many faculty members were involved in the project at each institution?*
 - a) *Respondent's university _____*
 - b) *Partner university 1 _____*
 - c) *Partner university 2 _____*
 - d) *Partner university 3 _____*
 - e) *I don't know*
- 7) *To the best of your knowledge, during the most current grant year, approximately how many total students were involved in the project from all partner universities?*
- 8) *To the best of your knowledge, during the most current grant year, approximately how many students were involved in the project from your university?*
- 9) *To the best of your knowledge, during the most current grant year, approximately what percentage of the total number of students from your university who were involved in the project are:*
 - a) *Non-US citizens _____*

- b) US citizens _____ (If none are US citizens, please skip to Q14)
 c) I don't know

If answered "none" to 9b, "Since none are US citizens, please skip to slide #6" Skip to Q11

10) During the most current grant year, of the students from your university who are US citizens, approximately what percentage of them are:

- a) Black _____
 b) White _____
 c) Asian-American _____
 d) Hispanic-American (not of African descent) _____
 e) American Indian/Alaskan Native _____
 f) I don't know

11) Who first conceived of this partnership-based project? (check one)

- a) It was my idea
 b) Faculty at my university (excluding yourself)
 c) Faculty at a partner university
 d) It was a joint idea between me and the other partner PI(s)
 e) An administrator at a partner university
 f) An administrator at my university
 g) It was a joint idea between administrators at my and another partner university
 h) I don't know
 i) Other(please explain)

12) Why did you decide to participate in this partnership? (check one)

- a) It was my idea
 b) I was assigned to do it by an administrator
 c) I was asked to do it by an administrator and I accepted
 d) I was asked to do it by a colleague at my university and I accepted
 e) I was asked to do it by a colleague at a partner university and I accepted
 f) Other(please explain) _____

13) *To what extent did your institution make the following arrangements for you to work on this project?*

Scale: 0 =not applicable, 1= no extent, 2=a small extent, 3=a moderate extent, 4 = a large extent, 5 = a very large extent

- a) Reduction in my course load*
- b) Increased technology to support my university's contribution to project*
- c) Increased administrative assistance*
- d) Funding for partnership project related-travel*
- e) Release time*
- f) Other _____*

14) *In your opinion, what motivated your university to support a partnership instead of pursuing the project alone?*

15) *When did you first become involved in this partnership?*

- a) During the project planning stage*
- b) During the operational stage (ask Q16, then skip to Q26)*

16) *What formal role(s) did you fulfill for this project? (multiple answers possible)*

- a) Writing the proposal for the project*
- b) Leading activities for planning the implementation of the project*
- c) Managing the overall project*
- d) Managing the project on my campus*
- e) Conducting research*
- f) Supervising students*
- g) Providing extension assistance*
- h) Writing of publications and reports*

<p>For those who answer 15b, “Because you stated that you first became involved in the partnership during the operational stage, could you please forward to slide # 14 (go to Q26, Operational stage)</p>

III. Project Planning

“The following section contains questions that ask for information about the PLANNING stage of the partnership, or the period starting with the conceptualization of the project and ending with the initiation of the actual project.”

17) *How were the goals for the project developed (i.e., what was the process?)?*

18) *To what extent did you contribute to decisions made during the following activities?*

Scale: 1= not at all, 2=a small extent, 3=a moderate extent, 4 = a large extent, 5 = a very large extent

- a) *Conceptualizing the project*
- b) *Formulation of project goals*
- c) *Writing the proposal for the project*
- d) *Planning for the implementation of the project*

IF respondent is from a PWI and one of several partner universities listed in response to Q3 was an HBCU: *“You have mentioned that there was more than one other partner university, and one of these partners is an HBCU. In some of the questions that follow, you will be asked specifically about your relationship with one partner. Please consistently respond to those items according to your relationship with _____ (one of the HBCUs) and its faculty.”*

IF respondent is from an HBCU and one of several partner universities listed in response to Q3 was a PWI: *“You have mentioned that there was more than one other partner university, and one of these partners is a research university. In some of the questions that follow, you will be asked specifically about your relationship with one partner. Please consistently respond to those items according to your relationship with _____ (one of the PWIs) and its faculty.”*

IF respondent is from a PWI and there are several PWI partners per response to Q3: *“You have mentioned that there was more than one other partner university. In some of the questions that follow, you will be asked specifically about your relationship with one partner. Please consistently respond to those items according to your relationship with _____ (one of the PWIs) and its faculty.”*

“Now I will ask you questions about communication that took place during the partnership’s PLANNING stage.”

19) *Approximately how many months passed from the time this project was conceived until it was initiated?*

20) *And in that time, how many times did you communicate face-to-face with faculty from the other partner university during the planning stages?*

21) *In that time how often did you communicate by e-mail with faculty from the partner university?*

Scale: 1= once, 2=at least every other month 3=at least once a month, 4 = at least once a week, 5 = almost daily

If respondent is the only faculty member from his institution: “Because you are the only faculty member from your university involved in this partnership, please skip to slide #13. **Ask Q24.**

22) *How many times did you communicate face-to-face with other faculty members from your university who participated in the partnership during the planning stage?*

23) *How often did you communicate by e-mail with the other faculty members from your university who participated in the partnership during the planning stage?*

Scale: 1= once, 2=at least every other month 3=at least once a month, 4 = at least once a week, 5 = almost daily

24) *After the proposal was approved, how much time was spent planning for the actual implementation of the project?*

Scale: 1= almost none, 2= a couple of hours, 3= a day or two, 4= several days, 5= a week or more

25) *Explain what was done to plan for project implementation.*

IV. Project Operation

“Now I am going to ask you questions that require responses about the OPERATIONAL stage of the partnership, which begins when project-specific activities begin and ends when the project’s goals have been reached.”

26) Briefly describe the major activities carried out during the operational stage of the project.

27) To what extent did you contribute to decisions made during the following activities?

Scale: 1= no extent, 2=a small extent, 3=a moderate extent, 4 = a large extent, 5 = a very large extent

- a) Managing the overall project
- b) Managing the project on your campus
- c) Carrying out the project’s main activities (including conducting project research, curriculum development and teaching curriculum)
- d) Writing of publications and reports
- e) Supervising graduate student research
- f) Supervising or teaching undergraduates
- g) Providing extension assistance

IF respondent is from an PWI and one of several partner universities listed in response to Q3 was an HBCU: “You have mentioned that there was more than one other partner university, and one of these partners is an HBCU. In some of the questions that follow, you will be asked specifically about your relationship with one partner. Please consistently respond to those items according to your relationship with _____ (one of the HBCUs) and its faculty.”

IF respondent is from an HBCU and one of several partner universities listed in response to Q3 was an PWI: “You have mentioned that there was more than one other partner university, and one of these partners is a research university. In some of the questions that follow, you will be asked specifically about your relationship with one partner. Please consistently respond to those items according to your relationship with _____ (one of the PWIs) and its faculty.”

IF respondent is from an PWI and there are several PWI partners per response to Q3: “You have mentioned that there was more than one other partner university. In some of the questions that follow, you will be asked specifically about your relationship with one partner. Please consistently respond to those items according to your relationship with _____ (one of the PWIs) and its faculty.”

“Now I want you to consider communication during the partnership’s OPERATIONAL stage.”

28) During the typical semester, how often did you communicate face-to-face with faculty **from the other partner university** during the operational stage of the partnership?

Scale: 1= once, 2=at least every other month 3=at least once a month, 4 = at least once a week, 5 = almost daily

29) During the typical semester, how often did you communicate by e-mail with faculty from the partner university?

Scale: 1= once, 2=at least every other month 3=at least once a month, 4 = at least once a week, 5 = almost daily

If respondent is the only faculty member from his institution: “Because you are the only faculty member from your university involved in this partnership, please skip to slide #17.”

Ask Q32

30) During the typical semester, how often did you communicate face-to-face with other faculty members **from your university** who participated in the partnership during the operational stage?

Scale: 1= once, 2=at least every other month 3=at least once a month, 4 = at least once a week, 5 = almost daily

31) During the typical semester, how often did you communicate by e-mail with other faculty members **from your university** who participated in the partnership during the operational stage?

Scale: 1= once, 2=at least every other month 3=at least once a month, 4 = at least once a week, 5 = almost daily

32) Thinking about the entire life of the project, when communicating face-to-face with faculty from the partner university, where did you meet?

- a) On my university's campus
- b) At the campus of one of the other partner university(s)
- c) At a neutral meeting place, meaning at neither partner university's campus
- d) The location for pre-planning meetings altered among the partner universities
- e) We never met face-to-face

33) To what extent did you know the faculty involved in the project from the partner university before the project was conceived?

Scale: 1= no extent, 2=a small extent, 3=a moderate extent, 4 = a large extent, 5 = a very large extent

V. Overall Evaluation

“Now I want you to provide feedback regarding the partnership itself, the project and what you got out of participating in this partnership.”

34) *How satisfied are you with the following processes during the partnership?*

Scale: 1= very dissatisfied, 2=quite dissatisfied, 3=somewhat satisfied, 4 = quite satisfied, 5 = very satisfied

- a) *Activities related to the development of project goals*
- b) *The amount of involvement you were allowed in making decisions for the project*
- c) *Amount of time spent planning for project implementation*
- d) *The project-specific activities done during the operational stage*
- e) *Communication frequency among all partners*
- f) *Methods of communicating with all partners*
- g) *Communication frequency within my university*
- h) *The allocation of university resources that I needed*

“Please rate how much you disagree or agree to the following statements.”

35) *This partnership has been characterized by:*

Scale: 0= not applicable, 1= strongly disagree, 2=disagree, 3=neither disagree or agree, 4 = agree, 5 = strongly agree

- a) *A close working relationship with faculty members from the partner university*
- b) *A balance of power between my university and the partner university*
- c) *Capable administrators at the partner university*
- d) *Competent faculty members from the partner university*
- e) *Fair allocation of funding to my university for my participation in this project*

36) *I would be willing to participate in another partnership of this type.*

Scale: 1= strongly disagree, 2=disagree, 3=neither disagree nor agree, 4 = agree, 5 = strongly agree

37) *Why or why not would you be willing to partner again?(OPEN-ENDED)*

38) *In your opinion, to what extent were the following university-level goals achieved by your institution's participation in this partnership:*

Scale: 0= not applicable, 1= no extent, 2=a small extent, 3=a moderate extent, 4 = a large extent, 5 = a very large extent

- a) *Increased access to tangible resources (i.e., funding, lab space, classroom space, lab equipment)*
- b) *Increased access to human resources (e.g., knowledge exchange)*
- c) *Increased certainty that stakeholders (i.e., project funding source, beneficiaries of the project) will be satisfied with the partnership and the project*
- d) *An improvement in quality research and educational programming for your academic department*
- e) *An improvement in your institution's reputation for participating in partnership projects of this type*
- f) *An improvement in the rate and success of underrepresented groups*
- g) *Other _____*

39) *Briefly describe any obstacles that were encountered during the life of the partnership.*

40) *Briefly describe any factors that helped promote the success of the partnership.*

41) *What did you personally get out of participating in this partnership?*

42) *In your opinion, how successful was this partnership?*

Scale: 1= not at all successful, 2=slightly successful, 3= somewhat successful, 4 = quite successful, 5 = very successful

43) *Overall, how satisfied are you with the outcomes of this project?*

Scale: 1= very satisfied, 2=quite satisfied, 3=somewhat satisfied, 4 = quite satisfied, 5 = very satisfied

VI. PI Descriptors

“Now I want to ask you some personal information.”

44) *What is your gender?*

45) *What is your faculty rank?*

- a) *Assistant Professor*
- b) *Associate Professor*
- c) *Full Professor*
- d) *Other _____ (specify)*

46) *Are you tenured?*

***If yes, please go to the next slide”. Skip to Q48
If no, ask Q47***

47) *Are you in a tenure-track position?*

48) *What university department do you represent?*

49) *Do you have any administrative responsibilities?*

50) *Are you a US citizen?*

***If no, end interview
If yes, ask Q51***

51) *What is your ethnicity?*

- a) *Black*
- b) *White*
- c) *Asian-American*
- d) *Hispanic-American (not of African descent)*
- e) *American Indian/Alaskan Native*

“That concludes this interview. Do you have any questions?”

Thanks for taking the time to respond to the questionnaire. If you do have questions at a later time, please do not hesitate to call me or Dr. Denis Gray using the numbers provided in the informed consent form you received by e-mail.

Good-bye.”

Appendix G: Descriptive Statistics of Logged Variables

Variable	HBCU		PWI		PWI2	
	Log Mean	<i>SD</i>	Log Mean	<i>SD</i>	Log Mean	<i>SD</i>
Distance	2.01	.77	2.06	.69	2.39	.75
Percentage of funding allotted	1.51	.40	1.64	.30	1.26	.36
Total number of faculty members	.82	.41	.38	.27	.34	.36
Total number of students involved from all universities	1.41	.66	.90	.58	.80	.26
Total number of students from respondent's institution involved in partnership	1.03	.57	.46	.42	.41	.20
Total face-to-face inter-university communication during planning stage	.31	.31	.35	.32	.34	.26
Total face-to-face intra-university communication during operational stage	1.42	.50	1.44	.91	1.23	.93

Appendix H: Significant Bivariate Correlations by Variable Domain

Variable Domain	<i>r</i>	<i>p</i>
<u>Satisfaction with Partnership Processes</u>		
Degree of respondent's involvement in decision-making during operational stage	0.42	0.03
Partnership formed due to suggestion by university administration	-0.41	0.04
Knew partner faculty before partnership formation	0.57	0.00
US citizenship	-0.33	0.10
Perceptions of partner equality	0.53	0.00
Degree to which respondent perceived partnership successful	0.59	0.00
<u>Satisfaction with Project Outcomes</u>		
Number of partner universities	0.41	.04
Total number of students involved from all partner universities	0.39	.05
Number of roles performed by respondent	0.38	.06
Degree to which respondent perceived partnership successful	0.39	.05
<u>Perceptions of Partnership Success</u>		
Number of partner universities	0.39	.05
Location of face-to-face meetings altered among partner universities	0.53	.00
Face-to-face meetings at respondent's university	-0.44	.02
Perceptions of partner performance	0.44	.02
Satisfaction with partnership process	0.59	.00
Satisfaction with project outcomes	0.38	.05
Partnership formed due to suggestion by university administration	-0.35	.07
Amount of time spent planning for project implementation	0.38	.05
Respondent's willingness to participate again	0.56	.00
Perceptions of partner equality	0.39	.05
<u>Willingness to Participate Again</u>		
Face-to-face meetings at respondent's university	-0.42	.03
Perceptions of partnership success	0.56	.00
Perceptions of partner performance	0.58	.00

	<i>r</i>	<i>p</i>
<u>Resource Access Achievement</u>		
Total number of faculty involved	0.34	.09
Original idea for partnership was respondent's	-0.38	.05
Original idea for partnership was a joint idea between respondent and the partner PI	0.42	.03
Frequency of inter-university e-mail communication during planning	0.41	.03
Face-to-face meetings at respondent's university	-0.44	.02
Respondent was assistant professor	-0.33	.09
Respondent was associate professor	0.44	.02
Degree to which university made arrangements' for respondent's participation in partnership	0.52	.01
<u>Achievement of Research and Education Improvement</u>		
Importance of research and/or knowledge creation in partnership project	0.39	.05
Total number of faculty involved	0.34	.08
Total number of students involved from respondent's university	0.47	.01
Original idea for partnership was partner faculty's	-0.37	.06
Original idea for partnership was a joint idea between respondent and the partner PI	0.34	.06
Number of roles respondent performed	0.38	.06
Amount of time spent planning for project implementation	0.35	.07
Degree to which university made arrangements' for respondent's participation in partnership	0.48	.01
Degree of respondent's involvement in decision-making during operational stage	0.43	.03
Respondent was white	-0.44	.02
<u>Achievement of Improvement in Success of Underrepresented Groups</u>		
Respondent was affiliated with a PWI	-0.47	.02
Total number of students involved from all partner universities	0.65	.00
Total number of students involved from respondent's university	0.38	.06
Respondent has administrative responsibilities	0.34	.09
Respondent is US citizen	0.39	.05
Respondent is black	0.52	.01