

The Pennsylvania State University
The Graduate School
College of Information Sciences and Technology

**SWIMMING UPSTREAM:
THE CASE OF BLACK MALES IN INFORMATION TECHNOLOGY (IT) HIGHER
EDUCATION**

A Dissertation in
Information Sciences and Technology

by

Curtis C. Cain

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The dissertation of Curtis Cain was reviewed and approved* by the following:

Eileen M. Trauth
Professor in the College of Information Sciences and Technology
Dissertation Advisor
Chair of Committee

Lynette Yarger
Associate Professor in the College of Information Sciences and
Technology

Michael McNeese
Professor in the College of Information Sciences and Technology

Suzanne C. Adair
Assistant Dean of the Graduate School

Kshiti Joshi
Philip L. Kays Distinguished Professor of Information Systems
Department of Management, Information Systems, and
Entrepreneurship
Washington State University
Special Member

Andrea Tapia
Associate Professor in the College of Information Sciences and
Technology
Director of Graduate Programs

*Signatures are on file in the Graduate School

ABSTRACT

The underrepresentation of Black males in Information Technology (IT) is a problem in academia and our society. Information Technology (IT) fields have traditionally been dominated by White and Asian males. Significant research has been conducted to begin to understand the causes that deter women from entering IT. This dissertation employs theory that has been developed to understand women's underrepresentation in IT and has applied it to the context of Black males in IT. The capacity to use IT enables individuals to participate fully in society. In today's highly technological and connected world, IT fields can provide an opportunity to engage in a thriving workplace. However, to have a more inclusive workforce it is necessary to understand what challenges face underrepresented minorities and how they navigate around those challenges.

In this study, the Individual Differences Theory of Gender and IT (IDTGIT) was used to understand factors that contribute to Black male undergraduate students' willingness to pursue IT degrees. Qualitative methodology was used to conduct structured interviews with Black males who attended a historically black college or university (HBCU) or who attended a predominantly white institution (PWI). These interviews sought better understanding of the individual, personal, and environmental influences that impact one's decision to choose and remain in the IT field. Reflexivity was then used as a method to understand the participant responses as well as reflect on the researcher's own lived experiences. Results relate to each of the three constructs of the theory: 1) Individual Identity (Race/Racial Identity, Age, Gender Identity and Personality/Personal Characteristics); 2) Individual Influences (Role Models, Significant People, Family, IT Identity and coping with Stereotype/Stereotype Threat); and 3) Environmental Influences (Preparation for the IT Field and the Role of Advising).

This project adds to the growing body of knowledge about not only race and gender but also how they manifest themselves in the IT field. The research motivation of this dissertation highlights the importance of better understanding Black males at the undergraduate level as a means to develop research and intervention programs related to increased engagement with this underrepresented population.

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I anticipate that this may be the only chapter that anyone who is not an academic actually reads so let me try not to mess this up. First and foremost I would like to thank God who served as a consistent reminder that I was destined to not only start the Ph.D. process but also finish.

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Finally, to my daughter, Taylor Adé Cain, daddy is a doctor now!

Chapter 1 - Introduction¹

Purpose and Motivation

This qualitative study is to identify and analyze the factors that support or undermine the achievement of Black males completing IT degrees and entering the workforce. In the United States, a country that professes to promote the concept of social mobility, education is critical. Postsecondary education is now essential for participation in an increasingly competitive technical labor market (Wilkins, 2006). The overall number of all minorities in higher education is steadily increasing. Although still not approaching the participation percentage of White students, Black, Asian, and Latino students have experienced significant increases in postsecondary education participation in the past 10 years. The data on the growth rates of Black students, however, indicate more of a good news/bad news scenario. Even though the total number of Black students is increasing, the gender gap between Black males and Black females in higher education has grown wider (National Center for Education Statistics, 2003). While Black female students are experiencing notable growth in enrollment and graduation, the participation of Black males is declining and is the lowest of all demographic groups (National Center for Education Statistics, 2003).

Black male under-representation can be broadly explained in terms of three experiences: educational, environmental and personal. In terms of education Blacks have been historically deemed academically inferior when compared to Whites. Black students are more likely to attend schools that are ill equipped with resources that contribute to providing a quality education at the same level as White students. Compounding this inequality in education is that the Black dropout

¹Because this dissertation research is grounded on a combination of personal life experiences (viz., as a “subject” as well as a “researcher”) and collection of data from black males, this introduction follows an unusual format; namely a brief autobiography to motivate the research and provide background information on my own experiences.

rate is higher than Whites. Furthermore, White students have a graduation rate from high school and college that is vastly higher than Black students.

Environmentally, Black students cope with varying levels of environment. One level is the prevailing environment in which they live. An example would be a mostly Black neighborhood or an ethnically mixed neighborhood. Another level would be the prevailing environment of the academic institution. An example would be a mostly Black school or a predominately White school. Black students seamlessly shift between environments and adjust behaviors depending on their surroundings. This shifting of behaviors is intensified when attending college away from home and with a demographic that is different than the prevailing environment from which one is accustomed.

Lastly, there are personal experiences that influence underrepresentation. These personal factors deal with personality and the ability to adapt and thrive in different surroundings. Another impact of personal factors is building and surrounding oneself with like-minded positive friends. Family also has an impact on personal factors that can either positively or negatively contribute to coping with underrepresentation.

The combination of educational, environmental and personal experiences magnifies their challenging likelihood to enter a career in IT. In the educational landscape for IT careers, Blacks are vastly underrepresented in the IT fields of study. In addition, environmentally, Blacks are underrepresented in the workforce as well as academia. Finally, preparing and adapting to careers in IT in which there are few people of color poses a challenge on a personal level.

The differences in educational, environmental and personal experiences, lend themselves to research which focuses on further understanding the ways in which these factors influence Black male IT identity development and career choice . Not all Black males are the same. There

are differences among them that must be evaluated and accounted for. Their differences could provide useful insight into what attributes successful Black men in IT have. These differences among the same group are referred to as within gender variation.

This research project is concerned with the contextual investigation into the factors and influences that contribute to understanding Black male underrepresentation in IT fields. The researcher uses his personal differences from many Black men as a lens and basis for understanding this topic. This study sought to identify the differences among Black men who excel in their pursuit of an IT career. It chronicles their personal triumphs, roadblocks and how they overcame them. This study analyzes both the individual as well as the group. The individual level lends itself to understanding how the Black men are different from each other and what their unique characteristics are. The group level looks across the demographic to better understand how they interact with the individual. Together, these levels of analysis provide beneficial insight into Black male qualities that are necessary for them to succeed in an IT career path.

Some have explained the low participation of women in technical fields by positing that women are either biologically limited (gender essentialism) or influenced by social messages (social construction). Trauth (2002, 2006) posits that these explanations are insufficient to truly address the complexities of women's technical abilities, interactions, barriers and the wide variation among women. Therefore, instead of grouping together individuals of a particular gender, the Individual Differences Theory of Gender and IT approaches underrepresentation in the IT workforce from the vantage point of adding individual agency, identity and experience in relation to life choices and societal influences (Howcroft and Trauth, 2004).

The purpose of this study is to use Trauth's Individual Differences Theory of Gender and IT to identify and analyze the factors that support or undermine the achievement of Black males completing IT degrees and entering the workforce. Specifically, this research seeks to add to the growing body of knowledge about Black male participation in IT education and IT careers. Thus far, much of the research about Black male participation in IT compares Blacks and Whites, as two static groups as opposed to studying the differences within each group. This analysis can only lead to a partial explanation of Black male differences. This approach also leaves out influences, which occur at the individual level of analysis. These influences have an impact on participation. This research expands these factors to describe the ways in which societal, environmental and institutional influences impact IT career pathway for Black males. There is one overarching question: how do individual identity, individual and environmental factors influence Black male IT student participation, development and degree attainment? The researcher's personal story suggests that the answer to Black male underrepresentation is a combination of environmental influences and personal influences

A Personal Narrative

A successful thesis focuses on a problem situated within society or one that stems from lived experiences. This thesis is a combination of both. The statistics suggest that as a Black male in my mid-twenties, I should have spent time in prison. The media often portrays my people as simultaneously aggressive, anti-intellectual, and lazy. Therefore, it would not be much of a stretch to wonder how I got to this point in my life, where I am in the midst of writing this thesis. Even I never thought I would be in this position.

I grew up in the inner city of Atlanta, spending the majority of my time at my Grandmother's house. My Aunt's house was located next door. The projects happened to be in

our backyard. My Grandmother worked on the assembly line at General Motors and had to be to work before I woke up for school. My mother is a phlebotomist who traveled long distances for work. There would be times when I would not see my mother for days due to her hectic work life. My father and mother separated shortly after my birth. He was in the Air Force and was never stationed in Atlanta. However, no matter how geographically spread out my family was, they all did the best they could. My Grandmother would make sure my breakfast was cooked before she left the house and left it wrapped in aluminum foil on the stove for me to warm once I got up. She would also give me a wakeup call, when there was a break on the assembly line, to make sure I was awake and found the lunch money she would leave me. My Mom never missed a holiday. I would see her every week and even on Valentine's Day she gave me a rose. My Auntie was a jack of all trades- her house was like a store. If I needed anything Auntie was always there. Then there's my older brother, Rob. He's two years older than I and was the ideal student. This was not a trait of mine. He won all the awards and was a straight-A student throughout elementary and middle school. By contrast, I was a C student. This was not due to a lack of ability, but rather my refusal to put forth effort beyond what was necessary to pass. My Mother hated when I earned C's. She would often ask why I could not be more like Rob. My mother's frustration was echoed by teachers who taught Rob two years prior, and often wondered where I went wrong. I do not know where I went wrong, but I do know that I get bored easily. If something did not interest me, I simply was not going to do it or at least not willingly or to my best potential.

The greatest gift my dad ever gave to me was my first computer, which he built in the mid-1990s. The computer my dad built for us occupied much of my time. I remember breaking it several times to the point where my dad got tired of fixing it when he would visit. Eventually,

when I was in high school my grandmother bought us a new desktop computer. I am sure the computer cost well over \$2000 at the time. It was new, which meant I could play with it and break it. I believe my grandmother knew that's what I would do so she invested in an extended protection plan. When I broke it, a repair technician, who happened to be a Black man, Gary Vause, would come out to repair it. He had his own company, Vause Computer Systems. His company handled all the repair work orders in Atlanta from the Home Shopping Network and QVC. After coming to our house a few times he took notice that I was interested and offered me a job in his company where I could make a few bucks on the side while in high school. Thanks to his help and encouragement, I quickly became the go-to person for all things technology related at school thanks to his help.

In high school a good friend, Kim, (the same friend who would go on to tell me about graduate school), mentioned that she thought I could perform much better in class than what I was doing. She said that I did just enough to get by. I never wanted to be the type of student who stood out. I would rather blend into the crowd. There was something about that conversation that resonated with me. During the summer after 10th grade, I enrolled in the Spelman Summer Enrichment Program. This was a program where students could take a high school course over the summer and receive credit for it. Some classmates of mine all got together and took Biology. I received a B in the course. When I returned to school at the beginning of the 11th grade, I noticed my schedule still had me registered in Biology. My magnet program coordinator would hand out bus passes during our class after lunch. When I went to get my bus pass, I told her that I was enrolled in the wrong class and that I took Biology over the summer and I would like to take AP Biology. She told me in front of the entire class that I was not smart enough to take Advanced Placement (AP) classes. I went on to enroll in Microbiology and successfully passed

every class that year. At the beginning of my senior year, I noticed she had enrolled me in 6 of 7 AP classes. I went to her office and had her remove me from all 6, citing her comment that I was not smart enough then so perhaps I am still not smart enough. I allowed my resentment of the magnet school coordinator to impede my own educational opportunities to take the AP courses. At the end of my 12th grade year, I raised my GPA and scored well enough on the SAT to be accepted to a few universities. After looking over my options, I elected to attend Johnson C. Smith University, a Historically Black College and University (HBCU) located in Charlotte, NC.

When I finished my Bachelor's degree in Information Systems Engineering, I had numerous job offers and initially accepted a position with Duke Energy in Charlotte, NC. The starting salary was more money than I had ever seen in my life and I thought that's what "successful" people did. In my mind they finished undergrad, if they were lucky enough to graduate from high school, and entered the workforce. Kim, who told me I could do better in high school, told me of this thing called graduate school. I had no idea what it was or what it took to get in other than taking the Graduate Record Examination (GRE). I promptly scheduled the GRE and applied for Ph.D. programs in Computer Science, as the end of the fall semester was rapidly approaching. After the initial wave of rejections, I became resigned to go into the workforce at the end of the spring semester. Then, to my surprise, I began to receive acceptance letters.

I thought to myself, "Wow, go figure, now I have options". I then scheduled visits to the schools and applied for different types of funding. I narrowed my choices down, looked a little closer at Auburn's Department of Computer Science and Software Engineering, and noticed two Black graduate faculty members, Juan Gilbert and Cheryl Seals. None of the other schools I applied to employ a single Black faculty member. I thought that with two Black faculty members

I would eventually find a specialty that I would be of interest. Moreover, they may understand my background more than other faculty members and be people I could identify with.

One day I was walking to the mailbox at my Grandmother's house to mail my confirmation of attendance letter, and I noticed that I received a letter from Auburn University with an offer of a National Science Foundation (NSF) Louis Stokes Alliance for Minority Participation (LSAMP) Bridge to the Doctorate Fellowship². The Bridge to the Doctorate is aimed at increasing the quality and quantity of multicultural students successfully completing science, technology, engineering and mathematics (STEM) baccalaureate degree programs, and increasing the number of students interested in, academically qualified for and matriculated into programs of graduate study. I rescinded my intent to work for Duke Energy and sent my letter of acceptance to Auburn.

I arrived to Auburn as a starry eyed kid having just finished a Bachelor's degree. However, I was met with a rude awakening of how different graduate school was from undergraduate work. Aside from the differences in coursework, I noticed a substantial difference in the ethnic makeup of this university in comparison to the one I came from and the environment I had been accustomed to. As I looked around in numerous classes the only Black people I saw were those who were advised by one of the two Black faculty members.

During my first semester as a PhD student, I had to pass the qualifying exam or take the equivalent course that corresponded to that section of the test. I went on to pass the qualifying exam. After my first year, my advisor left the university to go to Clemson University. I opted not to go with him because I had just passed all the qualifications for the qualifying exam and did not want to start over at another university. However, after my advisor left the university, most of the students of color went with him, which meant the already few became fewer.

²Louis Stokes Alliances for Minority Participation (LSAMP) program assists universities and colleges in their efforts to significantly increase the numbers of students matriculating into and successfully completing high quality degree programs in science, technology, engineering and mathematics (STEM) disciplines in order to diversify the STEM workforce. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13646

It was around this time that I saw something that I had not seen before. I was accustomed to being around Black students, as I had graduated from a Historically Black College/University (HBCU). However, when my advisor left the university and the vast majority of the Black students left with him I noticed that students were not sold on the institution or even their primary focus area but rather on the individual. I didn't realize how much one individual could mean in the eyes of students. I was also curious about why one faculty member meant so much to the underrepresented population? I was curious as to why students within a couple years of graduating with a doctorate in Computer Science would drop everything and start over fresh. This institutional and environmental change left me intrigued. A college with nearly two-dozen Black students instantly became one with a handful. As I looked around the college I noticed something about Auburn and other universities I visited, their lack of diversity.

With my advisor now gone, I turned my focus to Human Computer Interaction (HCI). My research focused on using programming languages to design culturally relevant design tools to teach minorities math and science. I changed my advisor to the only remaining Black faculty member. She took me into her already overcrowded lab for which I was greatly appreciative. When she first saw me, I wore a shirt that said "Genius by Birth, Slacker by Choice". She cautioned me that I should not wear shirts like that. I interpreted her advice as a way of saying that as a young Black male, I should mindfully shield myself from stereotyping.

While I saw the usefulness of HCI and I devoted much of my time to building applications and programs, I could not help myself from thinking about the lack of diversity within the college and my curiosity to want to understand why. I would attend conferences and symposiums such as the Association for Computing Machinery's (ACM) Richard Tapia

* ACM Richard Tapia Celebration of Diversity in Computing
* National Society of Black Engineers Annual Convention
ACM SIGMIS Computers and People Research
AIS Americas Conference on Information Systems

Celebration of Diversity in Computing where the topic of diversity would be the theme and I would hear the same things, “that’s an interesting topic but where would you study that?” or “that’s a great topic but wait until you have tenure to study it.” I was led to believe that being in a Computer Science program, that this particular type of research (i.e. IT Education and Human Resource Development) was seen as community service as opposed to research. This particular research focus was ill suited for a traditional Computer Science program, which focused primarily on Programming, Operating Systems, Algorithms and Architecture. A focus on IT Education and Human Resource Development with IT was regarded as intervention and community service work rather than as legitimate research. However, I could not see myself graduating in one area when the issue that drives my curiosity goes neglected in another. I could not understand why talented researchers put such critical issues on the back burner. I also could not see myself working diligently to achieve tenure before addressing the issue of underrepresentation.

Thus, two years away from finishing my doctorate in Computer Science I reached a crossroad, and questioned, “What should I do?” I decided to finish my Master’s at Auburn and move to an institution that would be more welcoming to my ultimate research area. However, given that graduate school acceptance is anything but straightforward and guaranteed, I applied for User Experience Design positions just in case my attempt to go to another school was unsuccessful. I received a position offer at Lexmark in Lexington, KY. While the offer was very appealing but I ultimately turned it down to return to school at The Pennsylvania State University. It was here where I met my advisor, Dr. Eileen Trauth, who is a gender expert in the research field of IT. Dr. Trauth is a White woman who has researched the lack of women in the IT workforce. Our research would dovetail as she is an expert in the field and I was particularly

interested in race and ethnicity. It was very difficult to leave a program where I was about two years away from graduating with a PhD to start from scratch. However, I figured this approach would be the best for my overall development. Unfortunately, it did not take long to realize that the ethnic makeup of the college at Penn State was less diverse than Auburn. Due to the location of the university, I was not surprised. At this point, I could use my own life experiences to reason why there were so few Blacks and realized just how relevant those life experiences are.

In the fall of my first year at Penn State, I applied for the NSF Graduate Research Fellowship. The title of my proposal was Swimming Upstream: Black Males in STEM Higher Education. I was the first Graduate Research Fellowship recipient in the College of Information Sciences and Technology. The fellowship helps ensure the vitality of the human resource base of science and engineering in the United States and reinforces its diversity. The program recognizes and supports outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based doctoral degrees at accredited United States institutions. I received the fellowship the following spring semester. By receiving the fellowship it told me that the problem of underrepresentation of Black males in IT higher education is not just an issue that I am noticing but one that is a significant problem in society and education.

I recently visited my undergraduate alma mater for homecoming and attended one of my undergraduate advisor's classes. I sat in the back of the classroom; similar to how I would when I was a student there. I would have on my usual clothes, which consist of jeans, t-shirt or polo and sneakers. Students in the class thought that I was just new to the class. Then my undergraduate advisor would walk in give her lecture and then introduce me. The students seemed to be shocked that I was a young, Black PhD candidate who has these NSF grants and would ask how

did I become so accomplished? I never had a response to their question because I did not see myself as accomplished yet. I do not feel accomplished. I do not believe I can be accomplished until I have a thorough understanding of why there are so few Blacks who seem to navigate what they experience as convoluted academic pipeline and overcome societal obstacles that hinder success in IT higher education.

Description of Dissertation Chapters

This dissertation consists of eight chapters. Chapter two presents a review of relevant the literature. In that chapter an overview of the literature in the areas of the diversity, stereotypes, stereotype threat, the academic pipeline and IT identity are documented. Chapter three documents the theory that guided this project and pilot studies. In that chapter, the choice of Individual Differences Theory of Gender and IT as well as two pilot studies and their results are described. In Chapter four, interpretative epistemology and reflexivity are documented. Also, the data collection methods and analysis processes are detailed. Chapter five contains a discussion of the findings from the data collection. Chapter six is a reflection of the researcher's lived experiences that provide greater depth to the results. Chapter seven is a discussion of the findings from the study along with the contributions of the study along with limitations of the student and directions for future research. The eighth and final chapter of the dissertation presents the conclusion and limitation of this study and future research that could emerge from this study.

Chapter 2 – Literature Review

The United States Department of the Interior – Office of Civil Rights website (2016) defines diversity as “a term that is used broadly to refer to many demographic variables, including, but not limited to, race, religion, color, gender, national origin, disability, sexual orientation, age, education, geographic origin, and skill characteristics. America's diversity has given this country its unique strength, resilience and richness." However, statistics show that diversity based on race/color and gender within Science, Technology, Engineering and Mathematics (STEM) is particularly low.

The capacity to use information technology enables individuals to participate fully in society. Capabilities, functioning, and well-being in society are a better measure of relative affluence or poverty than measures of income alone. Kvasny (2002) has argued that information technology can be used in ways that promote social inclusion, and that technology capabilities and access are integral to inclusion. However, major surveys published by the National Telecommunications and Information Administration (NTIA) and the Pew Internet and American Life project (2010) present descriptive data that show that Blacks have lower rates of home access to computers and the Internet (U.S. Department of Commerce, 2010). In comparison, 46 percent of Blacks use their phones to access the Internet compared with 33 percent of Whites (Pew, 2010).

The IT field is representation of nearly 90 percent being White and Asian males (Zweben, 2008; 2009). While addressing the National Education Association in 2010, President Barack Obama said, "We understand that our nation's prosperity is tied to innovation spurred on

by students' engagement in science, technology, engineering and mathematics" (NEA, 2010). He continued by saying, "For America to be technologically competitive in the future, our students must become more fluent in complex science and math." If the United States is to meet its need for world class talent in science, technology, engineering, and mathematics (STEM), it is essential that a diverse population be attracted to engineering and other technical fields (Chubin, May, & Babco, 2005). With a constant Black population we must begin to understand why there are relatively few Blacks in IT and how they identify with the field (Carter, 2015; Cain, 2012; 2013; 2015; 2016; Peckham et al, 2007;).

According to the U.S. Census Bureau, in 2012, 13.1 percent of the United States population was comprised of Blacks. Blacks trail behind the national average in terms of degree completion. The Black 4-year graduation rate is 63.6 percent compared to the overall U.S. graduation rate of 80.6 percent. The U.S. Department of Education (2010) states that there are more than 8 million Black public school students, 76 percent attend schools inside urbanized areas that include both city and suburban districts. The majority Black public schools have fewer certified teachers with degrees in the subjects they teach, which has contributed to many school closings in urban areas. For example in non-Black public schools more than 75 percent of math teachers had math as their major in college as opposed to 56 percent of teachers in majority Black schools. And of that 56 percent fewer were certified (USDoE, 2010).

Of the 13.1 percent Black population, only 18.7 percent had obtained a college degree (U.S. Census Bureau, 2013). In comparison, nearly one-third of Whites had obtained a college degree. The representation of Black males particularly in STEM fields is even . In 2008, 68,806 master's degrees were conferred in STEM fields, of which 4.47 percent were awarded to Black

men (NSF, 2008). Looking specifically at Computer, Information Science and Engineering (CISE), the total for Blacks is even more staggering.

Computer Research Association (CRA) reported the total PhD degrees awarded in 2008 in CISE to be 1,877 of which 1.6 percent were awarded to Blacks (Zweben, 2009). Eighty percent of enrolled CISE PhD students are male; 1.8 percent are Black males (Zweben, 2009). As of 2009, there were 6,443 faculty members in CISE major fields inclusive of Full, Associate and Assistant professors as well as research and teaching faculty and postdoctoral faculty according to CRA (Zweben, 2009), but only 1.3 percent were Black. Furthermore, a recent National Science Foundation (NSF) report on the employment and education patterns of underrepresented groups in science and engineering shows that while Black degree attainment in most fields has been trending upwards since 1999, degree attainment in Engineering is decreasing (NSF, 2012).

Black males represent 2.2 percent of those employed in STEM occupations. Few Black males are graduating and pursuing a degree in IT. According to the National Science Foundation (NSF, 2008), Black males received 8.5 percent of all Computer and Information Science degrees awarded in 2008. Comparatively, White males comprise roughly 30 percent of the United States population yet they received over 54 percent of all Computer and Information Science degrees awarded in 2008. Furthermore, less than a third of Blacks who receive a degree in STEM stay in their chosen field (United States Census, 2013).

The vast majority leaves science and engineering occupations (NSF, 2008). Black males are disproportionately underrepresented in higher education. The issue of underrepresentation of Black males in higher education is intensified when the alternative is considered. Sixty percent

of Black males who do not graduate from high school spend time in prison, and almost 30 percent of all Black men do spend time incarcerated (Monaghan, 2009).

Underrepresentation in STEM has historically focused on women, and has ignored within-group variation, and makes the assumption all men are well represented when comparing percentage of women to men. The research with women has led to increasing women's participation in STEM. Some of the barriers that impeded women's adoption of IT careers were beliefs about one's intelligence, stereotypes, male university faculty and implicit bias. The understanding of social factors plays a major role in understanding women's underrepresentation (Trauth, 2002). For example, a stereotype about men being intellectually superior to women in mathematics has an impact on women entering fields that rely heavily on mathematical concepts. Similarly, understanding social factors plays a major role in understanding Black male representation in IT. The successful research stream focusing on women's within group variation helped to situate the intra-group variation of this dissertation.

Significant research has been done on the digital divide, stereotypes and stereotype threat, and the academic pipeline, but more needs to be done to help us understand the dearth of Black males' participation in IT. We need to understand how the combination of these issues impact Black male participation in IT.

Digital Divide

The digital divide depicts how technology access and usage among different groups of people impacts adoption. According to Mossberger, Tolbert & Stansbury (2003), the term digital divide, coined in the mid-1990s, describes patterns of unequal access to Information Technology

(IT). Unequal access to IT was based on varying socio-economic factors, such as education, race, gender, age and income. Blacks have historically been much less likely to have access to personal computers, than Whites, and thus have felt the greatest impact of the digital divide (Morgan, 2008).

On the other hand, digital inequality on the other hand takes the digital divide a step further. It references not only differences in access, but also inequality among persons with “formal” access to the Internet (DiMaggio & Hargittai, 2001). Formal access is defined as computer ownership and Internet access. DiMaggio & Hargittai (2001) found that as Internet penetration increased and access to the Internet became more widespread and abundant there was a new type of inequality that related to differentiation among groups of people. They suggested that the digital divide must be expanded beyond, those who have and those who do not. It also needs to include critical dimensions of inequality, such as usage of IT among differing ethnic groups. Usage refers to the mode of which the technology is being used. Examples of usage would be social media, applying and searching for jobs and creating a resume. They continue by positing that society is the source of digital inequality and policies should be enacted to combat inequality.

Researchers have studied how the digital divide and digital inequality influence underrepresented minority groups. For example, Kvasny & Keil (2006) conducted a case study in two Georgia cities, Atlanta and LaGrange, in response to the cities’ attempts to readdress the digital divide. Atlanta's initiative was to implement community-testing centers while LaGrange provided Internet with a set-top boxes³. Their findings indicated that inequality was reproduced due to the lack of a mechanism that extended beyond access to usage. Their findings were similar to those found in DiMaggio & Hargittai’s 2001 study. Other studies have concurred with

³Set-top boxes were internet TV boxes. These boxes gave residential users Internet access via a box similar to a cable TV box.

these findings that inequality exists socially, which deepens the issues of the digital divide (Kvasny, 2002; 2008).

Results from Kvasny's (2002) and Kvasny & Keil's (2006) studies, show the digital divide continues today, but in a different form. Today's digital divide is not so much about access as it is about empowerment (Jackson, Zhao, Kolenic, Fitzgerald, Harold & Von Eye, 2008), something that is used to define the next phase of the digital divide. Empowerment references a shift from access and use to educational, workforce and societal gain. It is more than having access to social networking sites, such as Facebook, or using text messaging. It is about being able to use the Internet and digital technology to communicate, access information, and engage in commerce. Thus, the problem is that users of IT, particularly Black males, should be empowered by the promise of the technology but it argues that they are not.

Banks (2005) has studied the obstacles to Blacks feeling empowered by technology. He links technology and empowerment to the Jim Crow era and segregation. Banks argues that the Black traditions of struggle for justice and equitable participation in American society exhibit complex and nuanced ways of understanding the difficulties of technology. Blacks inherently attempt to navigate through the seemingly impossible contradictions of gaining meaningful access to technological systems. Blacks see the good with technological systems and at the same time have to resist the exploitative impulses, such as spending exorbitant amounts of time on nonproductive tasks, which such systems always seem to present.

Jackson et al.'s (2008) study of 172 Black children found that there are differences in how people of different ethnicities use the Internet and to what extent. The researchers define intensity in regards to the ways the Internet is used and for how long. They found that Black males use the Internet less intensely than Whites, Latinos, and Black females. The study also

found that IT usage predicted children's academic performance and that length of time using IT and the Internet was a positive indicator of academic performance.

In contrast, Black females were the most intense users of cell phones and use the Internet in more diverse ways than other groups. These findings suggest that Black males may not view IT as a field that they associate with. Jackson et al (2008) also found that Black females embraced technology in diverse ways, leading all groups in text messaging, searching the Internet for information, as well as searching for health related information. Conversely, Black males lag behind other groups in IT usage with one exception: video gaming. This study emphasized that research and interventions should bring together culturally relevant tools to increase representation of Black males in computing and increase their level of technical awareness.

According to Pew Surveys (2010), mobile technology has changed the landscape of IT. Latinos and Blacks are more likely than the general population to access the Internet via cellular devices. However, despite the increase in mobile technology among underrepresented groups, the same research found that even with increased access to technology there is continuing segregation among ethnic groups online that correlates to the physical world (i.e. not venturing outside of one's cultural comfort zone). Segregation is inclusive of biological factors such as race and societal factors such as socioeconomic class and education.

Researchers' findings suggest that segregation online and correlates to the physical world could be a hindrance to cross cultural learning (Jackson et. al, 2008). Researchers have also found that minority groups are more likely to use their cellular devices for entertainment purposes rather than empowerment (Jackson et. al, 2008). Aaron Smith, a Pew senior research specialist, says there are obvious limitations on what you can do on a mobile device. Creating

and updating a resume is a classic example. "Research has shown that people with an actual connection at home, the ability to go online on a computer at home, are more engaged in a lot of different things than people who rely on access from work, a friend's house, or a phone," (Pew, 2010). Furthermore, the academic pipeline impact how Blacks interact with technology and continue to pose obstacles to the success of Black students academically.

Academic Pipeline

The academic pipeline refers to how individual, environmental and institutional factors influence, hinder or divert a person as one progresses along the path towards a goal (Margolis, Estrella, Goode, Holme & Nao, 2008). Researchers have studied pipelines related to minorities and women for completion of secondary, post-secondary, graduate and professional education. A significant amount of research had been conducted on the adjustment, academic achievement, persistence, and rates of enrollment and graduation in postsecondary institutions. A large amount of the literature on Black males within educational environments, however, features quantitative studies comparing them with other subgroups (van Anders, 2004; Gallien & Peterson, 2005; Evans, 2001; Hopkins, 1997).

In 1954, *Brown v. Board of Education* was a landmark case in which the United States Supreme Court ruled that separate public schools for Whites and Blacks was unconstitutional. A 2003 study by Jackson using national databases discovered that there are wide gaps between Black males' and White males' educational attainment (Jackson, 2003). However, more than 5 decades later, students of color are still exposed to different educational settings than Whites. Margolis et al. (2008) studies the vast differences in educational settings for students of color.

They posit that America struggles with a stratified intellectual class system for which there are unintended consequences of well-intended policies at every level. They position the argument of inequality as the access and denial of access to Information Technology (IT), satisfactory educators and resources.

Black Americans have endured a disturbing past to arrive at their current state. However, their current state is not equivalent to an equal state among the ethnic majority, White Americans, and other ethnic minorities, such as Asian Americans (Harper & Hurtado, 2011). STEM fields have been championed as a perennial pathway of success and innovation technology and engineering these fields have been strongly emphasized as the primary driving force of economic growth in the future. The economy has shifted from an industrial economy, where goods were manufactured, to a knowledge and information economy, where the focus is on the intangible (Margolis et al, 2008; Joshi & Kuhn, 2007; Joshi & Schmidt, 2006).

Black American recruitment and retention has been a major focal point in Science, Technology, Engineering and Mathematics (STEM) fields (National Science Foundation, 2007). We find ourselves at this moment in history with the number of engineering graduates at one of its lowest levels of the past 20 years, and yet a time when the demand for young people prepared to work in America's high-technology industries has never been higher. However, despite increasing research and intervention initiatives designed to reverse the trend of underrepresentation within STEM, Black Americans obtaining degrees in STEM has declined (National Science Foundation, 2007, 2009). Stereotypes and stereotype threat are partial factors contributing to the decline of Blacks obtaining STEM degrees.

Stereotypes, Stereotype Threat and Identity

A stereotype is a widely held but fixed and oversimplified image or idea of a particular type of person or thing. These stereotypes have evolved within American culture dating back to the colonial years of settlement, particularly after slavery became a racial institution that was heritable (Steele, 1997). The early blackface minstrel shows of the 19th century portrayed blacks as joyous, naive, superstitious, and ignorant. These are characteristics related to the way slaveholders in earlier years believed them to be. The idea of race in the United States is based on physical characteristics and skin color. It played an essential part in shaping American society even before the nation existed independently (Steele, 2010). The perception of black people has been closely tied to their social strata in the United States.

There are many stereotypes and most are imposed. An example of an imposed stereotype would be the color-coding system. From birth boys are dressed in blue and girls are dressed in pink. Of the many stereotypes of Black males, aggression is common (Fein and Spencer, 1997; hooks, 2004; Steele, 2010). However, the stereotype of being aggressive requires nuanced analysis to understand how that anger manifests. An example of aggression being imposed could be linked to gang affiliation that requires a certain level of aggression. The case of the aggression stereotype could come from a number of different lived experiences.

A second common stereotype is that Blacks are intellectually inferior to Whites, which scholars have refuted (Franklin, 1999; Cokley, 2005). Scholars have contended that Black students are intrinsically highly motivated; this motivation is not related to how they perform academically or to their academic self-concept (Cokley, 2005; Cokley, 2002; Cokley, 2003; Carter & Goodwin, 1994). While most racial subgroups have seen significant progress in their

postsecondary enrollment, little or no progress has been made in increasing participation rates among Black men over the last quarter of a century.

Stereotype threat is defined as being at risk of confirming, as self-characteristic, a negative stereotype about one's group. Blacks are susceptible to stereotype threat (Steele and Aronson, 1995; 1997). In essence, stereotype threat is an internal characteristic. Blacks are generally stereotyped, in the media, as superstitious, lazy, happy go-lucky, aggressive, intellectually inferior, ostentatious, active in sports and entertainment, yet perform poorly in academics (Fein & Spencer, 1997). Within IT there is a lack of research that identifies positive stereotypes for Blacks that they can embrace. Instead Blacks are still mired by general negative stereotypes of their race and of the IT field.

Steele and Aronson (1995) found that Black college students tend to obtain lower grades than their White counterparts, even when they enter college with equivalent test scores. Previous research has suggested that negative stereotypes of Black students' intellectual abilities play a role in this underperformance. Awareness of these stereotypes can psychologically threaten African Americans, a phenomenon known as "stereotype threat" (Steele & Aronson, 1995), which can in turn provoke responses that impair both academic performance and psychological engagement with academics. Steele and Aronson's (1995) research has shown that Blacks, who enter a predominately White organization feel that there is a pressure to disprove preconceived stereotyping. Many Blacks feel that they have to say the right thing, not say too much, or agree just to fit in. In many cases, Blacks attempt to disprove stereotypes until their technical value can be exemplified to the organization and/or when the organization recognizes their value.

Stereotype threat is when an individual responds to what they believe is a stereotype even though the presence of an actual stereotype may not exist. Steele & Aronson (1995) performed

four studies on 114 Black and White undergraduate students at Stanford University. Steele and Aronson entered the study with an assumption that Blacks internalized the stereotype of intellectual inferiority to Whites. Their first study investigated the effect of stereotype threat on the intellectual performance of Black college students. Overall, the results showed the White students performed at a higher level than Blacks in each group. Results indicate that Blacks viewed the test as more biased compared to Whites. Black participants' self-ratings regarding performance were less than the White cohort. Black students have been shown to have a strong negative reaction to perceived stereotyping (Steele and Aronson, 1995; Steele, 1997; Steele, 2010).

Vulnerability to stereotype threat may exist regardless of whether or not an individual assigns validity to that stereotype (Shapiro et. al, 2007). Steele posits that an automatic reaction could occur in which an individual is aware of the assumption and therefore responds accordingly. The degree to which stereotype threat was experienced varies from person to person and reaction heightens depending upon the stereotype (Jackson, 2006; Jackson, 1999; Steele, 1997). Steele's (1995; 1997; 2010) work has shown that stereotype threat is a major factor to the hindrance of Black student success. Working to disprove the stereotype may seem everlasting and overwhelming, and may be impossible if certain individuals do in fact manifest characteristics of the stereotype (Steele, 1997).

When capable Black college students fail to perform as well as their White counterparts, the explanation often has less to do with preparation or ability than with the threat of stereotypes about their capacity to succeed (Steele & Aronson, 1995; Steele, 1997; Davis, Aronson & Salinas, 2006; Hamilton, 2009). These threats emerge from both stereotypical representation and

lack of representation in a particular domain. There is evidence to support the conclusion that stereotype threat hinders belief in one's ability to carry out tasks and engage in activities.

According to Jackson et al. (2008), there are two factors that influence self-doubt about the IT domain. The first is making a group aware of their own ethnic and class-based identities through a negative stereotypic association. The second is the group's ability to use technology effectively. These two factors can evoke self-doubt about the ability to gain mastery in this domain. The presence of individual and group identity may be a contributing factor that leads to evoking self-doubt and the ability to gain mastery of a domain.

The digital divide manifested into digital inequality. Digital inequality demonstrates a lack of using IT for empowerment amongst Blacks. The academic pipeline faces challenges which include funding, in elementary and secondary educational institutions whose primary demographic are Black students. Stereotypes and stereotype threat cause one to doubt themselves, especially minorities. The combination of digital inequality, the academic pipeline, stereotypes and stereotype threat form barrier to successful IT degrees and stem acclimation into the lucrative field that lacks diversity. There are two issues that arise from the IT field being majority White and Asian male. First, since there are fewer women and Black men in IT, their perspectives may not be brought to the forefront in policy, instruction, learning style and administration (Tickles, 2006). Second, Black men may have a more difficult time adjusting to the profession due to a lack of identity affiliation (Jackson et. al, 2008).

Trauth et. al (2012), administered a survey to explore the effects of race, ethnicity and socio-economic class on gender typing in IT. The study was conducted at twelve universities throughout the United States. Of the over 4000 survey participants, 377 being Black males, the researchers found evidence of the influence of race on gender stereotypes about IT professionals.

Furthermore, of the 39 IT skills survey participants were asked to rank as masculine, feminine and gender neutral, Black males classified no skill as feminine, which is a stark contrast to White males. One of the findings from the study was the Black male's reluctance to assign any skill as feminine. This may speak to their desire to not feminize their work (Trauth et. al, 2012). Their reluctance can be traced back to and partially explained by their identity, which leads them to assume masculine traits.

What is lacking is sufficient research to analyze and understand the problem of underrepresentation of Black males in IT. Despite the dismal outlook for many Black males, there are those who successfully navigate through the higher education system to attain a baccalaureate degree. These are the men able to provide new insights about Black males who do participate in IT and persist, and perhaps their experiences illustrate strategies that may assist those in the future. Studies that analyze the factors that influence Black male participation may provide new insight into the disparity of Black males and their White counterparts. Such research could provide the basis for interventions that could lead to the reversal of the trend and get more black men into IT careers. Given the current economy, careers, which can offer lucrative pay and opportunity, are more important than ever.

Similar to stereotypes about Black males in IT, there is limited research that attempts to understand the Black male identity within IT. This lack of research may lead to Black males struggling to find their identity in a domain where they are a minority in society as well as the field. Within the cultural framework of America Black males may find difficulty in their ability to negotiate the way in which they have been socialized and institutionalized to think, act, and behave (Harris, 1995). Some scholars assert that race and the lack of diversity cripples the Black male's ability to truly transition into manhood. He is left to constantly struggle and fight for an

identity, for power, for respect, and for understanding of who he is versus what he is projected and stereotyped as being (hooks, 2008; Banks, 2006).

The culmination of these issues motivates a need for a better understanding of the ways in which academia is cultivating and nurturing the needs of Black male students pursuing degrees in IT. More research should be conducted on what individual influences and increased agency leads to greater participation. More detailed knowledge about differences among Black males an intra-group and individual level analysis is needed.

The following are some relevant research questions:

1. How do Black male Individual Characteristics influence IT degree pursuit and attainment?
2. In which ways do Black males cope with societal characteristics that influence IT degree pursuit and attainment?
3. How do Institutional Characteristics encountered by Black males influence IT degree pursuit and attainment?

The Individual Differences Theory of Gender and IT is a theoretical lens that can assist with understanding Black male participation in the White and Asian male dominated, IT environment.

Chapter 3 – Theory and Pilot Studies

Some have interpreted the low participation of women in technical fields by positing that women are either biologically limited (gender essentialism) or influenced by social messages (social construction). Trauth (2002, 2006) posits that these explanations are insufficient to truly address the complexities of women's technical abilities, interactions, barriers and the wide variation among women. Therefore, instead of grouping together individuals of a particular gender, the Individual Differences Theory of Gender and IT approaches underrepresentation in the IT workforce from the vantage point of adding individual agency, identity and experience in relation to life choices and societal influences (Trauth et al, 2004). The notion of individual agency is also crucial in the underrepresentation of Black male participation in IT to understand how they navigate socially imposed stereotypes.

Trauth advocates for the investigation of influences that draw from a combination of socio-cultural themes and individual differences. Thus, the Individual Differences Theory of Gender and IT provides recognition of the importance of social influences, while emphasizing that personal characteristics, interests, and abilities are also significant shaping factors (Morgan, 2008). In this dissertation, Trauth's Individual Differences Theory of Gender and IT is being applied to a new domain: Black males.

Individual Differences Theory of Gender and IT

Trauth's Individual Differences Theory of Gender and IT, which has been successful in understanding the underrepresentation of women in IT was used, and adapted, in this research to analyze Black male undergraduate students in IT fields.

The theory was developed as a means to understand the topic of underrepresentation of women in the technical workforce that essentialism and social construction could only partially explain. In Trauth and Quesenberry's (2007) critique of essentialism they argue that while some relevant differences in ability may be biologically based they are not based on gender. Further, essentialism does not add contextual factors, which may affect an individual's perspective or interaction with technology.

The other perspective used to understand gender and IT is social construction, which describes gender as "two separate groups of men and women who are affected by two different sets of sociological influences. Hence, men and women are viewed as having different or opposing socio-cultural characteristics, which subsequently affect their relationship to and adoption of technology." (Trauth and Quesenberry, 2007, p. 23).

Social construction identifies social forces that may shape the male or female life, but minimizes individual agency or different experiences that affect responses to those factors (Trauth et. al., 2009, Trauth et. al, 2008; Trauth, 2002). Given these two differing theoretical perspectives of essentialism and social construction, they can be interpreted as describing only partial elements of the factors experienced by women in IT. As Trauth (2006) points out, "current theories about gender and IT do not fully account for the variation in men's and women's relationships to information technology and the IT field" (p. 1759). It is this variation that Trauth has argued is central to different people's experiences, decisions, and relationship to technology.

The Individual Differences Theory of Gender and IT (Table 1-1), consists of three major constructs to explain gender variation in participation in the IT field: i) individual identity, ii) individual influences, and iii) environmental influences (Trauth et. al, 2009; Morgan, 2008;

Quesenberry, 2007). The individual identity construct consists of two sub-constructs: personal demographics (e.g. ethnicity, socio-economic class, family background) and career items (i.e., type of IT work). The second construct, individual influences, consists of two sub-constructs: personal characteristics (e.g., educational background, personality traits) and personal influences (e.g., mentors, role models, and significant others). Lastly, the environmental influences construct consists of four sub-constructs related to the geographic region; cultural influences, economic influences (e.g. cost of living, cost of education), policy influences, and infrastructure influences (e.g. institutional climate) (Trauth et al, 2009).

Construct	Subconstruct	Examples
Individual Identity	Personal demographics	age, ethnicity, socio-economic class
	Type of IT work	software development, Information Systems (IS) design
Individual Influences	Personal characteristics	educational background, personality traits, abilities
	Personal influences	mentors, role models, significant life experiences
Environmental Influences	Cultural influences	attitudes about women & IT
	Economic influences	cost of living
	Societal infrastructure influences	availability of childcare
	Policy influences	laws about gender discrimination

Table 3-1. Constructs of Individual Differences Theory of Gender & IT (Source Trauth et al., forthcoming)

The Individual Differences Theory of Gender and IT has been used to interpret the underrepresentation of women in IT (Kvasny et al, 2009; Trauth, Quesenberry and Yeo, 2008; Trauth, Quesenberry and Huang, 2008). The theory utilizes socio-cultural phenomena to explain

differences and thus suggests alternative reasons to essentialism and social construction that account for within same-gender variation, to explain women's low participation in technology. The theory suggests, "both gender and IT are socially constructed at the individual level"... [and that] "women as individuals experience a range of different socio-cultural influences which shape their inclinations to participate in the IT profession in a variety of individual ways" (Trauth et al., 2004, p. 115). This theory was applied to new research domain for this study: Black males.

Pilot Studies

Two pilot studies were conducted during 2011 to gauge whether the Individual Differences Theory of Gender and IT would be an appropriate theory for investigating Black males in IT. The interview guide Trauth developed came from a National Science Foundation funded research project (NSF Award# 0204246), which sought to understand the underrepresentation of women in the information technology (IT) field, which is a significant factor in the American IT skills crisis. The project states that there is a lack of theory to explain the gender imbalance. The goal of the project was to investigate the ways that the social shaping of both gender identity and IT influences women in IT careers.

The pilot studies were conducted at a Predominately White Institution (PWI) and at a Historically Black College and University (HBCU). One institution is located in the Mid-Atlantic and the other in the South. Fourteen students were interviewed using an interview guide that was developed by Trauth (Trauth, 2002). Additions to Trauth's interview guide were made and indicated in Appendix A to strengthen the analysis for Black males.

The research questions for the first pilot study were: 1) How are Black males in IT education exposed to stereotyping or stereotype threat? and 2) To what extent do stereotypes explain Black male participation in IT? In the first pilot study, the constructs of the theory were used to analyze interview data on the presence of stereotypes and coping mechanisms of Black males who are studying IT education at a PWI. For the second pilot study, the research question was: 1) Where are the leaks in the academic pipeline which influence Black male participation in IT higher education?

The individual identity construct of the theory was applied in the studies to analyze ethnicity and family. The second construct of the theory, individual influences, was used to study the presence, or lack of, mentors and role models for Black males. Lastly, the environmental influences construct of the theory was adapted to examine the organizational and societal climate for Black males pursuing IT degrees (Trauth et al, 2009). These pilot studies then contributed to the development of the dissertation methodology and conceptual model.

Pilot Study 1

In the first pilot study, the constructs of the theory were used to analyze interview data on the presence of stereotypes and coping mechanisms of Black males who are studying IT education at a PWI. The individual influences construct relates to stereotypes about personal characteristics (i.e. personality). The individual-identity construct highlighted stereotypes related to race (i.e. ethnicity). The environmental influences construct presented stereotypes coming from the societal climate. To better illustrate participant responses, a table was developed to show how students responded to stereotypes and stereotype threat. Table 3-2, shows the results

from this study highlighting stereotypes, quotations from interview participants and their connection to theoretical constructs.

Stereotype	Example	Impact	Response	Theoretical Construct
Black men are lazy	A team member said, “You don’t need to come to any of the meetings, we’ll put your name on the assignment.” -Tom	Desire to combat stereotype	Tom took a lead role on the team project that challenged the stereotype. Leadership is something emphasized by his mother.	Individual Influences (personality, mentors, role models, significant others)
Black men are unintelligent	A team member said, “Don’t worry about doing anything. Your contribution can be the references” - Sebastian	Desire to combat stereotype	Sebastian challenged the stereotype by stating the will to participate in a larger portion of the project. Sebastian’s advisor often reminded him of the importance of leadership.	Individual Influences (personality, mentors, role models, significant others)

<p>Black men are inexperienced about the IT field</p>	<p>An employer said, “It’s ok if you haven’t had any experience with infrastructure design.” -Reggie</p>	<p>Desire to combat stereotype</p>	<p>Reggie stated that his participation in student-led organizations and internships combated the stereotype. Reggie had experience with corporate and federal internships.</p>	<p>Individual Identity (IT work experience)</p>
<p>Black men live in “ghetto” culture</p>	<p>A team member said, “That’s what I’ve seen in the music video.” -DJ</p>	<p>Succumb to stereotype</p>	<p>DJ laughed and stated he has seen the video too. DJ let entertainment and what had been seen on TV speak to the overarching culture.</p>	<p>Environmental Influences (attitudes, society, culture)</p>
<p>Black men are aggressive</p>	<p>A guidance counselor said, “There’s no need to raise your voice, we watch TV.” - Mike</p>	<p>Desire to combat stereotype</p>	<p>Mike challenged the perception by stating that Black men are not the aggressive people seen on television.</p>	<p>Environmental Influences (culture, individual influences, significant others)</p>

The insights collected, guided by the interview guide provided by Trauth (2002), give evidence that they knew stereotyping was likely to happen or that they have already experienced it, as shown in Table 2. The results provide evidence that in regards to the second question that there is a varying influence on Black male participation in IT. Results suggest that Black males both succumb to and combat the stereotypes.

The findings of the study provided three insights about the stereotyping of Black males in the IT field. The first insight involved the prevalence of Black males who wish to overcome stereotypes rather than succumb to them. Tom, Sebastian, Reggie and Mike combated their stereotypes by responding in a way that disproved the stereotype. DJ on the other hand succumbed to the stereotype by acknowledging Black male representation in the media correlated to reality. A second insight is the acknowledgement that Black males understand that they will be stereotyped in an environment that is White male dominated. For example, Reggie experienced stereotyping in his internship where a White coworker assumed he did not know how to build and test complex algorithms. A third insight is that regardless of whether the student attends a Predominately White Institution (PWI) or Historically Black College or University (HBCU), they understand that outside of the institutional structure there are barriers and overcoming these barriers are key to a successful career in IT. These findings provide evidence that more research is necessary to identify ways to combat marginalization of Black males in the IT. With the benefit of these findings we will be able to better create future interventions. The pilot study shows that stereotype and stereotype threat are concerns for Black males pursuing careers in IT and that future research could focus on further understanding how stereotypes and stereotype threat impact Black males in IT (Cain & Trauth, 2013).

Pilot Study 2

For the second pilot study, the research question was: 1) Where are the leaks in the academic pipeline which most affect Black male participation in IT higher education? The purpose of the second pilot study was to locate where the leaks are in the academic pipeline affecting Black male students in IT. To accomplish this an interview-based investigation of seven Black males to identify how individual identity, individual influences and environmental influences affect retention in the academic pipeline at a PWI and HBCU. The study was designed to help understand leaks within the academic pipeline, which could lead to barriers for multicultural students. Semi-structured interviews were employed, which were informed by Trauth's Individual Differences Theory of Gender and IT (Trauth et al, 2009).

The constructs of the theory were used to analyze interview data about the life experiences of Black males who are studying IT education. The individual influences construct presented the importance of positive role models and mentors throughout one's upbringing. The individual-identity construct highlighted issues related to ethnicity and family, which lead to marginalization within the IT field. The environmental influences construct was observed with issues related to organizational climate and societal climate for Black males pursuing IT degrees. The results (Cain & Trauth, 2012) are summarized below.

Thomas, 21, is from West Africa and went to school in France before moving with his mother to the USA in early 2007. Tom's mother and father are nurses. His first language is French and he learned English as a second language. Tom attends a PWI, transferring into an IT program as a junior from Engineering.

Personally, after I took up to Calc 3 and I had to take more math, that was the primary decision that I came up with to switch. Also, after I did more research

based on pay between engineering graduates and IT graduates, I came up with a high percentage that after you graduate from IT you should not be without a job because there is so much you can do and it's not limited.

Tom attended a technical school while in high school which afforded him the opportunity to acquire a few computing certifications. He has worked as an assistant network administrator for a radio station. Tom aspires to work within cyber security in the government. When asked if he feels IT is “welcoming to minorities” he responded:

We all strive to say racism doesn't exist...it does, so I don't agree with that. Being a minority at a great school... and a Black guy, I find it a little challenging...being a Black guy, personally, it's a hard major to get a hold of. Out of all my classes that have 40 or fewer students, which are all except one, I'm the only Black person and I've been struggling with that. However, I see it as a challenge to make the best out of it.

Sebastian is a senior at a PWI studying IT. Sebastian is 22. He has never met his father and does not feel the need to since his father has not reached out to him. Sebastian transferred into IT from liberal arts. When asked about the IT field being welcoming to minorities he said:

I feel as though, with respect to the different units within the university that the IT unit can do more to be more welcoming of students of different backgrounds. Looking at the concentration of [minority] students in the unit, the sheer low number tells a lot. I look at the involvement of students in the clubs within the college as well and the concentration of minorities is a lot lower, likely indicative of the few that are majoring in the IT unit. You may have none to one or two minorities in the clubs as a whole. I feel as if that is a very good indicator of

what's being done to be sure students of diverse backgrounds feel welcomed, feel like they can be involved in organizations and feel like they are a part of the college as a whole. Hearing students talk about how they don't feel diversity clubs are not necessarily important and not understanding the reason behind having an organization like that in the college is telling of how the college is being portrayed to the students as well as how the students perceive the college.

Reggie, 21, is a senior studying Computer Engineering at a HBCU and hopes to be a systems engineer. He is a first generation college student. His mother went straight into the workforce after high school and his father went to the military. Reggie is the youngest of four siblings. His brother is a bank teller, his older sister works at a furniture store and his youngest sister is pursuing her master's degree. When asked about any role models or mentors who have helped him academically and to form his career goals he said:

My advisor! I've asked him just about every question about computers I could think of. He's really helped me out a lot. He's helping me out with Physics right now. You know....he's just doing his job. He's my advisor so trying to guide me and telling me about careers and what I can do with the Computer Engineering major. He's had a helping hand in my major and what I wanted to do. He's helped me with looking at graduate school and fellowships too. What's funny, when I was in high school, I knew I wanted to go to college. However, in college, I had no idea what graduate school was. That hit me around junior year, when I started hearing about graduate school and what it was.

Mike, 21, is a senior majoring in Computer Science at an HBCU. He has two sisters and a brother. His older sister graduated from community college. His younger sister went to

community college for a semester, but dropped out. His brother went to barber school. Mike is a first generation college student. When asked about any role models and mentors he said:

That's a difficult question. I had an interview with a financial company the other day and that question came up. I honestly don't have any. My father died when I was young, I didn't get to know him. My stepfather definitely isn't a role model. My counselors, especially those in high school were racist and catered to the problematic students and counselors would rather see them get out of their school so they didn't have to deal with them but didn't care about my education. I have a lot of people in my life that I don't want to be like. So in a way, I suppose you can say, they shaped me in a positive way through their negativity.

Based on the literature and lived experiences, I entered this research with two themes relating to the disassociation of Black males with IT. First, Black males had a poor understanding of the IT field based on literature and lived experiences. Second, if Black males did not persist in the field it was due to marginalization rather than ability or lack of interest. These two themes led to choosing the research participants as well as helping build the interview guide. The first theme was not present in the findings, as the students knew about the field and the types of opportunities that it presents. However, the second theme of marginalization in the field, from the limited number of student interviewed, was present. The findings of the study suggest three insights about the academic pipeline.

One issue is the absence of positive mentors and role models for Black males. For example, Reggie referenced a problem where there were no positive models to whom he looked

up but there were a number of Black males that he knew he did not want to be like because they were incarcerated (i.e. the opposite of a role model).

A second issue is that Black males feel a sense of marginalization within the IT field. Sebastian and Tom made reference to marginalization within the IT field where they felt the efforts being placed into recruitment and retention of Black males in IT was vastly overrepresented. While Black males stated that there is a need for increased recruitment and retention, those efforts do not show within the student and faculty body.

A third issue is that there are differences between PWIs and HBCUs students. The main differences as stated from the interviewees between the PWI and HBCU were the value of coursework and team building at the PWI versus the value of a one-on-one relationship with the academic advisor at the HBCU.

These three main themes are related to the three constructs of the theory. While these findings assist with revealing some of the factors that contribute to Black male underrepresentation in IT, there needs to be a deeper level of analysis of the factors as well as a larger study to increase sample size.

There is evidence that a diverse work force can contribute to increased staff retention and productivity (Goleman, 2013). It can enhance the organization's responsiveness to an increasingly diverse world and increase the organization's ability to cope with change, and expand the creativity of the organization. Understanding the factors that could contribute to decreasing underrepresentation could lead to the thoughts and ideas of underrepresented groups being brought to the forefront. The variation in response to the different factors shows the need to probe the individual level.

Chapter 4 - Methodology

Epistemology

The epistemology of this study is interpretative. Interpretative epistemology is grounded in phenomenology and hermeneutics. Hermeneutics is the method of text interpretation and meaning (Kinsella, 2006). Phenomenology is the philosophical study of the structures of experience and consciousness. Interpretative epistemology is “concerned with the approaches to the understanding of reality and asserting that all such knowledge is necessarily a social construction and thus subjective” (Walsham, 1993:5). The theoretical perspective of this study is that the social shaping of individuals occurs through learned behaviors and experiences thus an interpretative epistemological approach is appropriate. However, as a Black male conducting research about Black males, reflexivity also plays a major role in the research study.

Interpretive studies generally attempt to understand phenomena through the meanings that people assign to them (Myers, 1997). The epistemological stance on interpretive approaches is that knowledge of reality is gained only through social construction such as language, shared meanings, tools, documents etc. (Walsham, 1993). Interpretative epistemology was used to study the underrepresentation of Black males in IT. I applied this epistemology because interpretative research facilitates understanding of social phenomenon. Interpretative research also allows for the understanding of social processes, which influence Black male participation. Interpretive research is especially helpful when the questions being examined are explanatory in nature. It is then necessary to focus heavily on human intent and meaning, which is at the heart of interpretive research. Interpretive ontology views all reality as subjective reality. Epistemology and ontology are interconnected. Ontology is meant to be a statement of truth (i.e. what we

accept to be fact) while epistemology concerns itself with understanding the factors that make said statement true (i.e. how we arrived at the meaning). The uniqueness of interpretative work is that every human being is unique and every bit of social life has its own meaning, feeling, intention and motivation. These are unique components that influence interpretative research.

The participants in the study may find commonalities of lived experiences with the researcher. Most of the participants are attending HBCUs and majoring in Computer Science, Information Science or Engineering (CISE) disciplines. Since I shared lived experiences with the participants, I found it necessary to use reflexivity when conducting, writing and presenting this research.

Reflexivity

As a Black male conducting research about Black males, I am often asked about my role in my research. My role is one that is complex. I cannot be disinterested because the topic of Black men in STEM fields is one that impacts me. Additionally, my connection to the subject area and compassion for participants will influence participant interaction and results. On one hand, being a Black male presents issues of potential bias towards interpreting the results of your interviews and interactions. On the other hand, being a Black male provides opportunities for enhanced interaction with the subjects that may not be possible if I were White or female. Reflexivity provides a means for remaining as transparent as possible with how my interactions are influencing the research process. It is a complex web we weave when, as qualitative researchers, we are impacted and inspired by the research that we are performing. We can no

longer be the unbiased researcher we were trained to be. This however, is where reflexivity comes in.

Reflexivity means that researchers are working to be consciously aware of how their interactions in various stages of the research process influence the research participants (Schultze, 2000).

“Reflexivity requires an awareness of the researcher's contribution to the construction of meanings throughout the research process, and an acknowledgment of the impossibility of remaining 'outside of' one's subject matter while conducting research. Reflexivity then, urges us "to explore the ways in which a researcher's involvement with a particular study influences, acts upon and informs such research." (Nightingale & Cromby, 1999, p. 228).

Bourdieu (1992) recommends reflexivity to be used at all times throughout the research phases. He mentions that conscious attention to the influence of one's position is necessary to embrace bias by being transparent. Bourdieu continues by stating that researchers must continuously reflect back on their own dispositions and remove prejudices that influence results. However, as Nightingale & Cromby (1999) point out, it is impossible to remain outside of one's subject matter while conducting research. Gouldner (1971) contends that reflexivity is viewed as the analytic attention to the role of the researcher in qualitative research. Gouldner continues by giving a general overview of how to conduct reflexivity positing. He suggests that the researcher should engage in a self-critique and explain how the researcher's actions have or have not influenced stages of the research process.

Willig (2008) contends that reflexivity does assist with controlling bias, but that is not all reflexivity is about. She says that reflexivity allows us to reflect on our own reactions to the research that make understanding possible. Since there is no set format to address reflexivity, it can be difficult to ensure that reflexivity is being addressed. Instead, Willig (2008) offers insight to how reflexivity can be addressed by including reflections on the role as the researcher and that those reflections be clear and honest. "A researcher's background and position will affect what they choose to investigate, the angle of investigation, the methods judged most adequate for this purpose, the findings considered most appropriate, and the framing and communication of conclusions" (Malterud, 2001, p. 483-484). As such reflexivity is necessary in qualitative research in establishing that the research is ethical and its findings are accountable, i.e. rigor, trustworthy (Kvasny, Greenhill & Trauth, 2005; Jootun, McGhee & Marland, 2009; Truex, Holmstrom & Keil, 2006).

Dowling (2006) positions the argument for reflexivity as one that occurs on multiple levels. One level requires the researcher to be aware that he or she is unavoidably involved in the process and results of the research. Another level instructs that the researcher is aware of what is influencing the researcher's internal and external responses, while also being aware of the researcher's relationship to both the research topic and research participants (Klein and Myers, 1999). When combined, these levels represent the two types of reflexivity: personal and epistemological. Similarities exist between reflection and reflexivity. Reflexivity is an awareness of the relationship between the researcher and participants. In order to be reflexive, one must undergo self-reflection. However, Finlay (2002) posits that reflection and reflexivity may be similar, but the latter is more active than simply reflecting.

Epistemological Reflexivity

‘Epistemological reflexivity’ requires us to engage with questions such as: How has the research question defined and limited what can be ‘found’? How have the design of the study and the method of analysis ‘constructed’ the data and the findings? How could the research question have been investigated differently? To what extent would this have given rise to a different understanding of the phenomenon under investigation? Thus, epistemological reflexivity encourages us to reflect upon the assumptions (about the world, about knowledge) that we have made in the course of the research, and it helps us to think about the implications of such assumptions for the research and its findings. (Willig, 2008, p.10)

Trauth (2002) introduces the discussion of gender and IT by addressing the need to distinguish women in IT as a heterogeneous group. Howcroft and Trauth (2004; 2006; 2008) add to the discussion of gender and IT as well as epistemological reflexivity. The researchers show how the epistemological lens can shift from positivist to interpretative to critical. They achieve reflexivity by including their own personal reflections throughout the paper. The researchers also display how gender research agendas within IT can change depending on the epistemology. While the study itself was interpretative, the researchers discuss how the research question would differ if the study were done using a positivist or critical epistemology how the research question would differ. Trauth and Howcroft position the positivist researcher as a neutral and dispassionate scientist. A positivist research question in gender and IT research could be whether there are any gender differences, which is largely a quantitative analysis. The goal, in particular, is to analyze gender differences to see if they exist, not to explain why. As an interpretative

researcher, the research question would be to understand how gender differences manifest themselves. The goal is to add additional understanding to a growing body of knowledge about gender and IT. The criticism of interpretative work is that it is incomplete. By that, the focus is on understanding society as a factor that influences inequality but does not question it. Critical researchers about gender and IT would seek to understand why gender inequality exists. Critical research seeks to challenge the powers that reproduce inequality (Trauth & Howcroft, 2006).

Personal Reflexivity

‘Personal reflexivity’ involves reflecting upon the ways in which our own values, experiences, interests, beliefs, political commitments, wider aims in life and social identities have shaped the research. It also involves thinking about how the research may have affected and possibly changed us, as people and as researchers. (Willig, 2008, p.10)

Mruck & Breuer (2003) discuss why it is difficult to achieve personal reflexivity and address our own biases, choices and experiences throughout the research process sufficiently. They say due to our teaching of the scientific methods that we are taught to exclude subjectivity. They continue by saying that we were taught to include only what may seem to be required by the epistemology and methodology, as well as what we can control. By essentially being taught one process and ingraining it through repetition, it has become the culture of educators. With the culture of objectively ingrained in students, it is difficult for them to write about themselves as a part of the research. In essence, it is harder to achieve personal reflexivity than it should be.

Personal reflexivity requires that researchers become aware of the multiple influences that they have on their research and how, in turn, the research affects them. Remaining reflexive and acknowledging my role as a researcher is a method that is used throughout this research project.

In this research, my understanding of the participants comes from lived experiences. Personal reflexivity requires that I be transparent in how I conducted and analyzed the research to reach the results. Throughout the journey of analyzing the results, I used lived experiences of being a Black male pursuing degrees in IT, a reflexive journal to catalog my thoughts as I conducted the interviews, presenting preliminary results at peer reviewed conferences, giving guest lectures and attending minority focused IT conferences. A crucial part of personal reflexivity is being aware that my interpretation of the research is not the sole way of analyzing the research because social influences vary among people. Reflexivity comes by way of giving my participants a voice while also telling my own story. This leads to the importance of keeping a reflexive journal while conducting research. I can voice my opinions and interpretations in the journal and when appropriate in the write-up and dissemination phases include those reflections. Reflexivity in qualitative research is necessary for transparency and rigor. Being as transparent as possible allows for any bias that may have been introduced to be known. One approach that I took towards reflexivity was to simply write about it.

Research Design

The development of the research design for this study employed qualitative methodology. This methodology was focused on human characteristics and individual differences and their relationship to Black male IT degree attainment. Selection of the participants was careful to

include those who would be in the best position to answer the research question. This section describes the sampling strategy, participant recruitment, and research setting and data collection methods used for this research.

Sampling and Recruitment Strategy

For this study, it was necessary to recruit Black males who declared their major in an IT field. For the purposes of this study an IT major was defined as Computer Science, Computer Engineering, Information Systems and Information Sciences and Technology. Freshmen, in their first year of collegiate studies, were excluded from the study as they were less inclined to have declared a major and taken any major courses.

Recruitment was carried out through four sources: 1) The Pennsylvania State University College of Information Sciences and Technology Multicultural Affairs Office, 2) National Society of Black Engineers (NSBE) The Pennsylvania State University Chapter, 3) Johnson C. Smith University's Historically Black Colleges and Universities Undergraduate Program (HBCU-UP), and 4) personal contacts. The first 2 sources are located in central Pennsylvania. The third source is located in North Carolina. The last source is geographically distributed.

This study used theoretical sampling. Theoretical sampling is a method of sampling in which participants are specifically chosen to shape the research project (i.e. Black males). With theoretical sampling the researcher's goal is not the representative capture of all possible variations, but to gain a deeper understanding of analyzed cases and facilitate the development of analytic frame and concepts used in their research (Glaser, Barney G. & Strauss, Anselm L., 1967). As the observer gains more knowledge of a setting, he or she can make sampling

decisions that take advantage of events, as they unfold. Based on this, the research was steadily evolving to ensure Black males were interviewed that could provide insight into the research questions.

Recruitment of Participants

The Pennsylvania State University College of Information Sciences and Technology as well as Johnson C. Smith HBCU-UP provided contact information of participants willing to participate in the research study. The two offices maintain databases for Black males majoring in Computer Science, Computer Engineering, Information Systems and Information Science and Technology. Once Institutional Review Board (IRB) (see Appendices B and D) approval was granted, the researcher conducted recruitment of those participants who were willing to participate. I sent out IRB approved recruitment scripts to the individuals who indicated they would be willing to participate. The recruitment script was used to introduce participants to the study and the principal investigator.

Since the study was interested in only Black males, any other ethnicities and genders were excluded. In order to make the study as diverse as possible, within the selected demographic, Black male non-freshmen was the only requirement. This enabled the researcher the opportunity to interview Black male IT majors who were geographically different. I used my personal network to recruit additional Black male IT students. To accomplish this, I enlisted the help of friends at other institutions.

Participants/Subjects

There were a total of 30 research participants in this study. All the research participants were Black males and over the age of eighteen. The participants participated voluntarily, were not compensated and while they attended two schools, they were raised from geographically different areas.

Data Collection

The data collection for this study involved a structured interview guide. The interview guide was developed by Eileen Trauth (NSF Grant# 0204246, 2002). The guide was informed by the Individual Differences Theory of Gender and IT and used to determine how different factors influence Black male participation in IT (Trauth, 2002). The study investigated 1) How do Black male Individual Characteristics influence IT degree pursuit and attainment? 2) In which ways do Black males cope with societal characteristics that influence IT degree pursuit and attainment? And 3) How do Institutional Characteristics encountered by Black males influence IT degree pursuit and attainment? Interviews were conducted at the two institutions in a private room with the researcher and participant. A digital voice recorder was used, with participant consent, to capture the interview dialog to be analyzed later. Interviews ranged in time from 30 to 90 minutes.

The explored research questions are crucial to the current state of research and to society. First, there's a dearth of Black males in IT. This leads to a lack of Black male concepts and ideas being brought to the forefront as well as an opportunity for a lucrative career. If technology is truly the path of the future, then it is imperative that one of the groups that have historically been

disenfranchised not be without a place to provide insightful input. Second, if the issue with Black males in IT is with recruitment and retention, then this vein of research is crucial to gaining insight into why Black males continue to pursue a career in IT. Third, this research offers an opportunity to gain understanding of Black males from the individual and group level of analysis. This approach holds the potential to develop recruitment and retention strategies that could improve the current state of underrepresentation in IT. Furthermore, this approach holds promise for other ethnic minorities, such as Latinos, as a method to understand the factors that contribute to continued underrepresentation.

Chapter 5 - Results

This chapter presents the findings of a study examining the underrepresentation of Black male participation in Information Technology (IT). Throughout the results there are common themes related to individual identity, coping methods to deal with societal influences (derived from individual influences) and environmental influences, which are constructs from the Individual Differences Theory of Gender and IT. Partly because the methodology used for these interviews were guided by a structured interview guide the participants covered the same topics with roughly equal amounts of time. This chapter portrays my interactions with Black men in regard to obstacles, roadblocks, diversions and ultimately success in pursuing and staying on an IT career path.

The research centered around three research questions. The first research question was how do Black male Individual Characteristics influence IT degree pursuit and attainment? The second research question seeks to understand in which ways do Black males cope with societal characteristics that influence IT degree pursuit and attainment? The final research question was how do Institutional Characteristics encountered by Black males influence IT degree pursuit and attainment?

The chapter is structured as follows. The chapter opens with an overview of the theory that informed this study and guided the data collection and results that are presented in this chapter. Following the overview of theory there is a summary of interpretative epistemology. The subsequent section is a detailed review of personal reflexivity and how it was used in the analysis of the results. The next section is a summary of the participant demographics. Following that are tables that show which constructs of the theory are linked to each research question. Following the tables is a definition of each of the emergent themes from the interview data.

Following the definitions there's a brief background of each of the selected interviewees whose quotes comments appear in this chapter. Quotations are used to add context to the theoretical construct presented for the particular research question that the comment addressed.

Theory Summary

The Individual Differences Theory of Gender and IT, consists of three major constructs to explain gender variation in participation in the IT field: individual identity, individual influences, and environmental influences (Trauth, Quesenberry, & Huang, 2009). The individual identity construct consists of two sub-constructs: personal demographics (e.g. ethnicity, socio-economic class, family background) and career items (i.e., type of IT work). There were a total of four themes that emerged from the Individual Identity construct. The constructs that emerged include race, age, family, IT identity and gender identity.

The second construct, individual influences, consists of two sub-constructs: personal characteristics (e.g., educational background, personality traits) and personal influences (e.g., significant others). From the Individual Influences construct the themes that were explained were personality, exposure to IT, stereotypes, stereotype threat, significant people, role models and mentors. There were a total of seven themes explained from this construct.

Lastly, the environmental influences construct consists of four sub-constructs related to the geographic region; cultural influences, economic influences (e.g. cost of living, cost of education), policy influences, and infrastructure influences (e. g. institutional climate). From the Environmental Influences construct the themes that were explained were type of institution Predominately White Institutions (PWI) or Historically Black Colleges and Universities

(HBCU), preparation for IT Field, role of advising. There were a total of three themes identified from this construct.

Participant Demographics

The diversity of Black males majoring in IT was the focus of this research. An overview of the demographics of the participants in the study is provided and summarized in Table 2. The total number of individuals that participated in the study was 30. Participants were selected at random by their respective colleges to have a sample of upper and lower classmen who have declared their major. The study was conducted at two universities. One university is a Historically Black University (HBCU) in the South. HBCUs are institutions of higher education in the United States that were established before 1964 with the intention of serving the Black community. The second university is a Predominately White Institution (PWI) in the mid-Atlantic. At the PWI I was provided a list of Black students from the diversity unit from two colleges. I sent recruitment scripts to the students and interviewed those that were available at a time convenient for them. At the HBCU the diversity unit for the STEM majors recruited students for this research project. The different types of institutions were chosen to account for the varying academic environments in which Blacks typically receive degrees.

The age range for the participants was from 19 to 22 with a median of 20. All participants were Black males. There were 20 participants who came from single-parent households: 16 led by women and 4 led by men. All participants were single. Five participants had children.

In the category of socio-economic status, all participants identified their family as being

working class or middle class. Social class in this study was an open ended item which the participants were allowed to self-select. The reason for allowing the participants to select their own socio-economic class was that two different geographical locations were used in the study. Thus, the development of an income range that specified social class might have provided an inaccurate classification due to differences in cost-of-living in the two areas.

Furthermore, the participants in this study had not yet entered the workforce so their perception of social class was based on their upbringing. Since the participants are from geographically distributed areas it proved difficult to determine a set socioeconomic scale. Thus, the question of social class was left open for the men to provide their perception of the social class in which they were raised. The demographics of the participants are referred to again throughout the chapter specifically in terms of age, race and gender. Pseudonyms for participants are used in this document to protect their confidentiality.

First Name	Age	Classification	Type of School
Mason	21	Senior	HBCU
Ethan	20	Senior	HBCU
Alexander	20	Junior	HBCU
Matthew	21	Senior	HBCU
David	18	Sophomore	HBCU
Anthony	20	Junior	HBCU
Joshua	19	Junior	HBCU
Andrew	21	Senior	HBCU

Samuel	20	Senior	HBCU
Christopher	19	Junior	HBCU
John	18	Sophomore	HBCU
Ryan	20	Junior	HBCU
Nathan	21	Senior	HBCU
Carter	20	Junior	HBCU
Hunter	22	Senior	HBCU
Jonathan	20	Junior	HBCU
Jacob	19	Junior	PWI
William	21	Junior	PWI
Michael	19	Sophomore	PWI
James	21	Senior	PWI
Benjamin	20	Junior	PWI
Jackson	18	Sophomore	PWI
Levi	19	Sophomore	PWI
Aaron	22	Senior	PWI
Jordan	22	Senior	PWI
Nicholas	20	Junior	PWI
Charles	19	Sophomore	PWI
Austin	21	Junior	PWI
Robert	21	Senior	PWI
Brandon	20	Junior	PWI

Table 5-1. Participant Demographics

Each of these Black males discussed their transition from young boys searching for their place in the world to IT majors. They shared details of their life that prompted some emotional responses. I used the theory and lived experiences to provide context to their statements. In the next section I present the three research questions and their findings.

RQ1: How do Black male Individual Characteristics influence IT degree pursuit and attainment?

The first research question has themes from both the Individual Identity and Individual Influences constructs. The types of questions that were asked were in regards to personal background, what was the participant's definition of IT work and when was he first introduced to IT. There were a total of seven themes from the two constructs, four from Individual Identity and three from Individual Influences.

Construct	Sub-construct	Examples
Individual Identity	Personal Demographics	Race, Age and Family
	Type of IT Work	IT Identity
Individual Influences	Personal Characteristics	Personality, Exposure to IT

Table 5-2. Constructs of the Individual Differences Theory of Gender and IT Related to Research Question 1

Theme One: Race

The first theme is race. Race refers to grouping people who share distinct and similar characteristics such as skin color. This study focused on Black males. Race was the biggest theme in this study. Each individual discussed race throughout the interview because it was the primary topic of the interview. The differing dynamics of race in the IT field was the most

prevalent throughout the interviews (i.e. a sense of belonging and trying to fit in). However, race was also discussed at a deeper level than skin color (i.e. what do others (employers, colleagues, etc.) think of Black men's ability to contribute and excel in IT?). Across all participants they embraced the fact that they are Black and acknowledged that there are barriers to overcome as a Black male and certainly as a Black male in a White dominated field. They did not let race inhibit their decision to major in IT and ultimately seek employment in the IT workforce. Not only did these males embrace their racial identity but also they used it as motivation to overcome obstacles and handle adversity. One way some of the study participants used race, as motivation was by relishing being the only minority in the room and speaking intelligently to influence decision makers. Regardless of whether the participant was from a single parent household or socio-economic class all participants acknowledged the presence of perceived race based stereotypes and the desire to overcome those stereotypes.

An example of the race theme was present in an interview with Jacob. Jacob is a 19-year-old junior at a PWI. He grew up in a predominately Black neighborhood in New Jersey. He attended predominately Black schools during elementary, middle and high schools. His first time being a minority, in comparison to his environment, was when he arrived to college. Jacob is a junior at the time of the interview.

There were always challenges. I would say there are challenges that are faced from pursuing a career in an area that there aren't very many people who look like me. In a way I don't think that I was supposed to be in this position. I know I am capable of doing the work but I can't help but look around and ask why I'm the only person in this class.

While Jacob's comment is brief there is a significant message. He expressed the issue of belonging and identifying with the field. He also expressed that he was not supposed to be here. This is a sentiment that is expressed by many of the interviewees. If a Black male was raised in a high crime rate area they feel as if they were the lucky ones who got out. They tend to know friends and acquaintances that are either deceased, in prison or did not find a way to make it out of the economically challenged area. An underlying theme he expressed is the presence of internal obstacles, which can be seen as those from his neighborhood that are not familiar with some of the career opportunities that exist. To those individuals Jacob leaving was outside of what they consider to be the normal. This sentiment is one that extended to both the internal and external influences expressed in the theory.

Another example of the race theme was present in an interview with Anthony. Anthony is a 20-year-old junior at a HBCU. He grew up in a predominately Black neighborhood in Durham. He attended predominately Black schools during elementary, middle and high schools. He shared his experience in extra curricular activities off campus at a local PWI.

While I attend a HBCU, I live off campus in a pretty diverse area of student housing. The complex that I live in is down the street from [redacted] University. I have some friends that go there which is a totally different environment than the HBCU. Luckily we major in the same field. I find it to be very different. Just walking around on campus I just get a vibe that I'm one of the few pursuing Computer Science. Being raised in a Black environment, going to school in a Black environment yet knowing people who go to school in a White environment we're able to talk about the differences. Even during casual conversation my

friends are amazed by what happens on my campus and how freely I can express myself either in class or just social activities. The level of acceptance has to be a product of the type of prevalent culture on campus.

Anthony references campus culture. He feels very welcomed at his institution, which happens to be an HBCU, and somewhat out of place when he visits a PWI campus with his friends. He is getting his first experience of being an underrepresented minority when he goes to the PWI. His discussions with his friends about campus culture and what is allowed at a HBCU versus PWI catches both he and his friends off guard. He believes that the difference can be attributed to the dominant racial group on campus. The dynamic he expresses also highlights how he has to adjust his character and personality when he's on the campus of the PWI. On the other hand, he can be himself when he's at the HBCU.

Theme Two: Age

The second theme was age. In this study age references the number of years a person has been alive. Experience varies based on age group and thus this construct was important because it provides context to the generation these Black males were raised. Age was of particular interest because all of the participants were students who entered college immediately after finishing high school. None of the participants had an established career in IT before pursuing their degree. Few of the participants had IT work experience outside of an internship they participated in while in college.

An example of the age theme was present in an interview with Levi. Levi is a 19-year-old sophomore at a PWI. He grew up in a predominately Black neighborhood in Philadelphia. He attended predominately Black schools during elementary, middle and high schools.

*I don't think age is prohibitive in IT. I would like to think that I am afforded the same opportunities regardless of age. It's hard to deny that I'm the young guy. It's pretty evident *laughs* (referencing his lack of facial hair). However, I have always loved technology. I grew up around it. I think it's funny how some older people fear technology and what it has the ability to do. Meanwhile, I embrace it for the exact same reasons that they fear it. I feel as if they fear what they do not understand. I am always working to understand how to make technology work for me.*

Levi considers himself a digital native, a term that he uses to explain why he does view age as a detriment. Native to IT or Digital Native is a term that references those who were raised around technology such that it is ingrained in who they are. The participants ranged in age from 19-22 with an average age of 20. The lived experiences of these males, while significant, do not include work experience in the IT field. Most of the participants had held jobs during their time in high school or college (i.e. work study, internship, part time job) as a means to assist with tuition and have a source of income. Age was not related to a barrier in the findings. However, five of the men entered parenthood but had not entered the workforce. Even though most did not have IT work history, they knew about the potential of IT to be a lucrative career. This could be due to the participants being native to IT.

Theme Three: Family

The third theme was family. Family is a group of people associated by consanguinity, or birth. The concept of family presented itself in this study by the influence, or importance, of family on the participant's desire to pursue IT as a career path. Family was an integral component of the interviews because it highlighted some of the factors that influenced these male's decision to attend college and ultimately pursue an IT career. These family components were usually immediate family members such as mothers, fathers, grandparents and siblings. All of the participants indicated at least one family member that provided motivation for their decision to attend college. Nearly 70% of participants had parental guardians that did not attend college but they encouraged the participant to attend as a means to create a better future with a degree. There were aspects of interviews where fathers were and were not present in the male's upbringing. As a whole the presence did not deter these males from continuing to pursue IT. Family was critical as a support mechanism for the participants in maturing into adults.

An example of this theme occurred with in an interview with Nathan. Nathan is a 21-year-old senior attending a HBCU. He was raised in Tampa.

I wouldn't be here if it weren't for my family. They're a motivating factor for me.

When you go away to school and you are placed in a position where you don't know anyone yet you are pressured to succeed that really causes anxiety and stress. Granted, I decided to come here and I made the decision. However, it's not

until you're alone do you feel the real pressure. A lot of people can't handle it.

However, I knew I could pick up the phone and call. It's a life saver. I can't tell you how many times just calling home has kept me sane. I know my Mom and Dad

can't help me decode an algorithm or God forbid help me with math but they do

provide encouragement and helps to restore the faith in myself that I lost. When you enter a new area of your life sometimes you need someone to lean on and that's what they've done for me. I know for a fact that I wouldn't be here without them.

In many ways it was the concept of family that molded these young boys into young men capable of making decisions about the direction of their life. Many referenced family members that were supportive of their goals even though they may not necessarily understand the details of what it takes to achieve those goals.

Another example of this theme occurred with in an interview with James. James is a 21-year-old senior attending a PWI. His mother and stepfather raised him in a middle-class neighborhood in California. His biological father passed away at an early age.

That's a difficult question. I had an interview with a financial company the other day and during small talk I talked about where I was from and who I was as a Black man and the interviewer seemed stunned when I told him I was from an area outside of Oakland. My father died when I was young, he taught me a lot before he passed and I use those same lessons today. My stepfather definitely isn't someone I look up to.

When James mentioned his father during the interview he started crying.

One reason why James may feel so strongly about his father is because he too is one:

I have a son that I do not get to see often. I'm here in school and he's back at home. It's not easy but at least I have Facetime. He's motivation for me. I want him to have an easier upbringing in an area that's safe. I feel like getting a

degree will put us in a better position. I will teach him the same things that my dad taught me.

It was easy to tell that I hit a topic that was close to his heart. He loved his dad and he meant the world to James. When he would speak he would talk about things his dad would say and how his dad might handle a situation if he were here. On an individual influences level, he was adamant about were people who were nothing like his dad. In this regard he talked about his stepfather and how he did not consider him a role model. On a societal influences level, he references how an interviewer was surprised that he was from an area that is not known to produce many gifted individuals as James.

Theme Four: IT Identity

The fourth theme was IT identity. IT identity is whether or not a Black male associates himself with the IT field. Association with the IT field consists of feeling like he belongs in the field. IT identity was a theme that presented itself across all participants. Each participant felt the need to reference a desire to belong in the field. All recognized that the face of IT is not Black male. Participants who participated in internships spoke candidly about feelings of isolation when surrounded future colleagues who they felt doubted their abilities. However, after completing the internship they felt they had a better sense of what it would take to be successful in the field and a sense of knowing that combating stereotypes does not end when you walk across the graduation stage. IT identity and persistence to achieve one's goals were paramount in this theme. There was a lack of identifying with the IT field among the majority of study participants.

An example of the IT identity and fitting in was evident in Brandon's interview. Brandon is a 20-year-old junior classmen attending a PWI. He was raised in Chapel Hill in a predominately white neighborhood by his mother.

*I mean it's not like you see the picture of the Black guy on any Computer Science material. If you do it's usually one and you can tell he was feeling uncomfortable too *laughs*. The IT field isn't one that many Black people go into. It is what it is. It is disheartening. Even when I did my internship I got a dose of what it would be like in the workplace and it's the same as my classes. I would be lying if I said I didn't wish there were more Blacks in my field but I like the field. Even if the field isn't representative of my people, that doesn't mean that it will never change.*

There was a desire to make IT fit their identity as opposed to adapting to field. These males had ideas and visions of where they saw themselves going in their career. The same obstacles they overcame in choosing IT would be the same they face when acclimating to the IT identity. An example of the IT identity was present in an interview with Ethan. Ethan is a 20-year-old senior attending an HBCU. He was raised by his mother in a predominately white neighborhood in an upper-middleclass neighborhood in Maryland.

I didn't think there would be as many challenges as there are. I feel like the biggest challenge is just trying to feel like I belong. My college isn't representative of the field. In school I know I fit in because of my surroundings. During my internship, I knew I didn't fit in. Even though I grew up in a white neighborhood and felt like I belonged it's different when you're in the workforce. I feel like when I graduate that I'll be starting from scratch.

Ethan's biggest challenge was feeling like he belonged. At HBCUs the ethnic makeup for the university is usually over 80% Black. With that being said it's not difficult to understand why he says he fit in while in school but during his internship he did not. We can assume that the ethnic identity of his internship is similar to that of many IT companies where minorities are underrepresented. Entering that environment from an HCBU is a stark contrast to that which he is accustomed and necessitates a timeframe to become familiar with his surroundings.

The first research question also had themes from the Individual Influences construct. Individual Influences are the people or things that shape or mold and individual to become who they are. These influences can be imposed by others or derived from life experiences. The themes that were present were personal identity, personality and exposure to IT. Personal identity is individual characteristics that make a person unique. It is the individual characteristics arising from personality by which a person is recognized or known. The next theme is personality. Personality refers to individual differences in characteristic patterns of thinking, feeling and behaving. Exposure to IT references the first indication that Information Technology was interesting enough to pursue as a career. These three themes comprised the Individual Influences construct in RQ1 and the Individual Differences Theory of Gender and IT. An example of the individual influence of exposure to IT was present in an interview with Mason. He is a 21-year-old senior at an HBCU. His mother raised him in a single parent household. He was raised in a predominately Black neighborhood in Florida. He's a first generation college student.

Obstacles are what you make of them. I have always been goal driven and I have always had a love for technology. I think if you want to get something done you will find a way. I am not saying that there aren't racists and people who do not

want to see you be successful. There are several of them and some sit in the same classroom with you on the daily basis. However, I think you have to be able to overcome. As a Black man overcoming is something that you have to do day in and day out. You have to apply that same desire to overcome into every facet of your life.

Mason attributes his ability to successfully navigate barriers to persistence and exposure. This is directly linked to the individual influences construct in the theory. In the Black community overcoming is a term that is synonymous with the civil rights movement. The concept of overcoming has been engrained in decades within the community and suggests a mindset of being focused on a goal despite obstacles. He uses the term to describe his ability to understand that there will be numerous roadblocks that he will encounter and to reach a goal state must be persistent.

There's overlap in the statements made by each of the interviewees. They were raised in different neighborhoods, different socio-economic classes attend different schools and are from different backgrounds but the common theme is the lack of belonging in the field. This lack of belonging is increased by a lack of diversity in the field, which does not build a strong sense of identity affiliation with the IT field.

Key Findings	
Examples	Summary
Race	Participants were consistent in referencing race as one of the largest barriers to overcome when entering the IT field. They reference the White

	male dominated field as one where the number of Black males is particularly few.
Age	Age was not something that the participants saw as being a barrier. Even though most did not have IT work history, they knew about the potential of IT to be a lucrative career. This could be due to the participants being native to IT. Native to IT or Digital Native is a term that references those who were raised around technology such that it is ingrained in who they are. The interviewees that did mention age mentioned it as a factor when they were completing internships. They found it difficult to have their perspectives taken seriously because they were young and Black.
Family	Interviewees reference family as critical in supporting their career decisions. Furthermore some of these young men were fathers and they consider their education and desire to enter a lucrative field such as IT as a way for them to provide for their children.
IT Identity	The participants overwhelmingly faced difficulty trying to “fit” into the IT professional model. They referenced race as a key factor for the struggle to find a place for themselves within the IT field and even in their coursework, internships and group projects.
Personality	These Black males were persistent in their desire to pursue their dreams. They remained upbeat in pursuit of their goals and aspirations.
Exposure	There were varying levels of exposure to IT at an early age for the participants. Exposure is what accounted for their initial interest. Some of

	the means for initial exposure were video games as well a family and friends that were in an IT field.
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Table 5-3. Key Findings from Research Question 1

RQ2: In which ways do Black males cope with societal characteristics that influence IT degree pursuit and attainment?

The second research question has themes from the Individual Influences constructs. There were a total of three themes from this construct. The types of questions asked were in regards to events, people and literature that influenced the decision to enter into IT. Also, questions were asked about the influence of personal characteristics on the decision to enter IT.

Construct	Sub-construct	Examples
Individual Influences	Personal Characteristics	Stereotypes, Stereotype threat and coping with societal messages
	Personal Influences	Role Models

Table 5-4. Constructs of the Individual Differences Theory of Gender and IT Related to Research Question 2

Theme One: Stereotypes and Stereotype Threat

The first theme was stereotypes and stereotype threat. A stereotype is a widely held but fixed and oversimplified image or idea of a particular type of person or thing. Stereotype threat is defined as being at risk of confirming, as self-characteristic, a negative stereotype about one's group. In essence, stereotype threat is an internal characteristic based on how one responds to what he or she may perceive someone thinks, without definitively knowing. Some of the

stereotypes of Black males that emerged from the interviews were a lack of intelligence about the field. Most of the Black males chose to combat that stereotype by proving what they were capable of. An example of the Individual Influences construct of stereotypes was present in an interview with William. William is a 21-year-old junior attending a PWI. He grew up in a mixed neighborhood in Pennsylvania. He attended a mixed racial elementary, middle and high schools. He had both parents in his household. Both his mother and father were college graduates.

Stereotypes are the challenge. While growing up I felt the need to consistently prove my worth. It's as if the Black students were supposed to be lesser skilled than the White students. I did not want the easy parts of the projects. I wanted the more difficult sections because I felt like I had something to prove. Even though being around White students is nothing new, I still feel like an outsider. The only time I feel like I am not an outsider is when I am not in my Computer Science courses. When I would tell some of my teachers that I was interested in computers they looked at me weird as if they wanted to ask why?

Although William has been raised in a mixed neighborhood he has struggled with a sense of belonging. He mentions how he has never felt included. He felt like he has had to combat stereotypes and has done so in the courses that he has taken. His comments suggest that he has been exposed to stereotypes and have internalized stereotype threat. When he suggests that the only time he feels like he is a part of the larger group is when he's not in his Computer Science courses, which traditionally is a major in which few Blacks enroll. When he mentions that he told teachers that he wanted to major in IT and they looked at him as if he were weird, he's

referencing the fact that few Blacks go into the field. He's breaking from a norm that still has a tendency of catching some off guard.

Another example of stereotype threat was apparent with Charles. Charles is a 19-year-old sophomore at a PWI. He was raised in Nashville in a Black neighborhood. He attended Black schools when growing up.

I am very anxious when I go to my classes. I'm often the only one (person of color) in the room. I feel like I have to be a notch above the other students. Since I'm the only one it makes me question whether I belong and the only way to prove them (the White students and professor) wrong is to really but forth my best effort. Failure simply isn't an option...I need to set the example that we can do it too. I don't believe I've ever been as stressed to enter class than I am here.

Charles is experiencing both internal and external stressors that are challenging his ability to academically succeed. He believes that the other students and the professor are expecting for him to carry the weight of the Black race. His fear of failure is a fear that he may disappoint other Blacks. He is showing a struggle to fit in an area that he is the minority. He's placing undue stress on himself, which is an indicator of stereotype threat.

Theme Two: Societal Messages

The second theme was societal messages. Societal messages about belonging were present throughout the interviews. This theme is one that participants approached from differing perspectives. For example, some reached this topic by thinking about where they were raised and

how the computing field was not thought of as an option. Others approached it from a sense of being at times overwhelmed by the pressures to achieve and to make a path for others. An example of the societal messages theme was present in an interview with Michael. Michael is a 19-year-old sophomore attending a PWI. He's from a single parent household in New York. He was raised in a predominately Black lower-class neighborhood.

I remember going home this past summer and seeing some of my friends that didn't leave the block. Even though I grew up with them and went to school with them to them I was an outsider because I left the block. They don't see me leaving as an opportunity for me to better myself. I think you have to be able to overcome. As a Black man overcoming is something that you have to do day in and day out, whether with your own people or not. You have to apply that same desire to overcome into every aspect life.

Michael references the location where he was raised when asked about societal obstacles. He is aware of what he perceives as racists and people who would rather hinder than help him become successful. The notion of overcoming obstacles is a theme that presents itself throughout the interview as a mechanism for handling adversity. His handling of adversity is something that he applies to his everyday life in order to be successful.

Another example of the societal messages theme was present in an interview with Samuel. Samuel is a 20-year-old senior attending a HBCU. He's from a single parent household in Detroit. He was raised in a predominately Black lower-class neighborhood.

I remember the times in high school when we would go around the classroom and talk about what we were going to school for. When I said IT I would get weird looks from my teachers as well as peers. They did not seem to understand why I would do it. One of my teachers told me after class that it's not what Black people do. Luckily for me I've never been one to really follow what everyone else did. While I remember his comment I did not take it to be fact. Afterwards I went and spoke with my Computer Science teacher and he told me to disregard it. He then showed me all the jobs that I could get by studying Computer Science. That just reassured me that I should do something different than the norm.

Samuel ran into a different type of societal message. His messaging came from those trusted with educating him. Luckily he found another teacher, which was a role model, to remove the doubt about a career in IT and showed him the possibilities. These are two very different but potentially disastrous examples of societal messages from once trusted significant people in these young men's lives.

Theme Three: Role Models

The third theme was role models. A role model shares identity characteristics with a person and is generally successful and positive and thus others desire to be like them (Trauth et al, 2009). For example, for Black males, having a Black advisor or Black Internship Manager could serve as a role model. A mentor is someone who teaches or gives help but does not necessarily share the same characteristics as the person they are mentoring. Likewise, a White advisor to a Black student would serve as a mentor because a lack of shared identity

characteristics. Throughout the interviews the role model for many of the participants were family and friends that had a significant impact on their decision to enter IT. During interviews there were examples of positive and negative role models (i.e. people the interviewee did not want to be like). This was a different take on a term that is generally positive. Interviewees highlight the lack of people who identify with the African Diaspora in the IT field. This lack of identity affiliation leads to difficulty finding a role model in the IT field. An example of the role models theme was during Alexander's interview. Alexander is a 20-year-old junior attending an HBCU. He's from a single parent household in Washington D.C. He was raised in a predominately Black middle-class neighborhood.

I was strong willed and my Mom always told me to go to college. Even though she didn't go to college, she knew that it was a way for me to get further in life.

Alexander's comments, while brief, are powerful in their meaning. He has the insight to understand the pressures that are faced both internally, from those inside the environment, and external, from those outside the environment. He mentions that he was strong willed and that his Mom was a positive influence in his life to pursue a college education. His mother had the foresight to recommend that her son do something that she did not. She knew that by Alexander attending college that he would have more opportunities than those who did not.

Another example of role modeling came from Ryan. He is a 18-year-old junior attending an HBCU. His mother raised him in a predominately Black middle-class neighborhood. He gave a good example of who helped get him interested in careers in IT.

When I was a kid I used to love to play on the computer. I probably didn't know what I was doing but it was fun. When I got to high school I got a job at a local computer repair shop. I just lucked out on the job while passing time to get on the bus to go home. The owner came by me and said she remembered me because I would come in all the time just to walk around. She asked me did I like computers and I said yes. She then asked if I wanted an opportunity to do something more than just pass the time? Then she offered me a job. It didn't pay much but I got the opportunity to learn. I learned about the technical components and building computers. Then she started to teach me about programming. This was huge for me because my school didn't teach programming. Having the opportunity to learn from someone about something I was interested in really stuck. When I told her that I wanted to go to school for Computer Science she became very happy. She went on to tell me about her experience in school and how she worked for Microsoft, Dell and IBM before starting her own company. It was like someone really took me under their wing to show me a path that I hadn't fully recognized before.

Ryan shares a story about his role model. She is a small business owner that had a successful career with Microsoft, IBM and Dell. She then started her own business and hired Ryan after noticing how much time he spent in her repair shop. When he shared his desire to pursue Computer Science she then shared her professional experience with him and began teaching him fundamentals of programming that his school did not teach. Ryan saw this as valuable information and helped to affirm his decision to pursue a career in Computer Science.

Another example of role modeling came from Robert. He is a 21-year-old senior attending a PWI. He was raised in a predominately Black neighborhood by his mother and father in Gainesville. He was involved in a program during high school that helped to develop his interest in IT.

When I was in middle school and high school there was a program that I attended on the weekends. I am a really big gamer and have been to some of the largest gaming competitions in the world. During middle and high school there was a program at the local college where we would meet up to game on the weekends. Not only was it gaming for the students, who were primarily Black, they also taught us how the games were developed. We went into the physics behind the game's background engine, complex mathematics and geometry. They also provided SAT preparation for us to excel on the college entrance exams. This really gave us a behind the scenes look and really opened my eyes to the fact that going into gaming is not all about holding a joystick for hours on end. I was able to understand how complex some of what I thought basics games were. I'm not even talking about next generation gaming consoles either. I'm talking basic as in Pac-Man. I didn't believe how complex it really was and the AI (Artificial Intelligence) that went into developing it. At the end of the sessions they would bring in minorities that were both studying IT and Engineering or those that already graduated and went on to work for pretty large companies. I looked forward to attending every weekend. I was on edge as to whom I would meet next. They helped to give me faith that I could handle this work because they had done

so before me. We built a network. I can tell you that I've definitely used them throughout my studies here and I've been able to succeed because of them.

Robert gives examples of a support group that he participated in where he met role models. He was able to use gaming as a resource to develop his passion of completion gaming into a career. He then went on to leverage his network of people he met to succeed in his coursework and projects. These individuals were instrumental in Robert pursuing IT and Engineering as well as providing positive reinforcement that he was capable of doing the work.

A common theme among most of the participants was the lack of Black role models. The lack of Black role models could be attributed to the issue of Black identity within IT coupled with other societal issues that further limit Black male's participation in society (i.e. incarceration rates). The Black males in this study found role models where they could even if they were not males who led to instances where females served as role models. Other genders becoming role models for Black youth provides some insight that the traditional concept of who can serve as a role model has to be re-visited. Role models may not always take on the visual appearance of the student; instead there are other intangible characteristics that these students were receptive towards.

Key Findings	
Examples	Summary
Stereotypes	The participants often referenced stereotypes and the need to overcome them. They would mention being given lesser roles on team projects

	because their White team members thought they were incapable of completing the work.
Stereotype Threat	Stereotype threat was more prevalent than the actual perceived presence of a stereotype. They felt the need to outperform because of their race. They mentioned having something to prove about their ability to do the work.
Societal Messages	Messages about belonging to the IT professional group and messages from those who they knew when they were growing up and trying to explain the field of IT and why they chose to enter it were present.
Significant Others	Role models and mentors fall into the significant others category. These men referenced family, friends and teachers as role models. Role models have shared characteristics in common with the Black males. Other interviewees referenced mentors that they interned with or professors who inspired them and they serve as mentors for the men. Furthermore, there were examples of the reverse mentor or role model (i.e. people the interviewee did not desire to become)

Table 5-5. Key Findings from Research Question 2

RQ3: How do Institutional Characteristics encountered by Black males influence IT degree pursuit and attainment?

The third research question has themes from the Environmental Influences construct. There were a total of three themes from this construct. The types of questions that were asked were related to perceptions about society and education in regards to if the IT domain was welcoming to minorities.

Construct	Sub-construct	Examples
Environmental Influences	Institutional Environment	Type of institution, Preparation for IT Field, role of advising

Table 5-6. Constructs of the Individual Differences Theory of Gender and IT Related to Research Question 3

Theme One: Type of Institution

The first theme was the type of institution. This study interviewed participants who attended PWIs and HBCUs. Because of the difference in schools in student population and demographics we were interested in studying some key differences. To put things in context, the HBCU has a student population of around 2000. The HBCU is an institution that serves only baccalaureate degrees. The campus of the HBCU is 105 acres. The PWI has an undergraduate student population of over 46,000. It also has a Graduate School with a graduate student population of over 10,000. The campus of the PWI is in excess of 5000 acres. The size of the institution as it relates to resources and the ability to get individual help were consistent topics in among the participants. Generally, the larger institution had more resources as far as lab equipment and contacts for potential post-graduate employment opportunities. However, the smaller institution had more of a sense of community between students and professors that facilitated easier individual attention. An example of the type of institution theme emerged during an interview with Matthew. Matthew is a 21-year-old senior at a HBCU. He was raised by his Mom in a predominately Black neighborhood in North Carolina. He attended predominately Black schools throughout his life.

The lack of resources here can be a bit overbearing. Other schools have better labs and key partnerships within the industry, which help with jobs after graduation. Resources are pretty important because a job once you graduate is not guaranteed. It cost a lot of money to come to college and I would like to know that it would pay off. We have career fairs but that can be a hit or miss. I heard of graduate school but did not know about all the graduate school opportunities until you mentioned the details of it. I wish I had known about the research thing you were talking about. I am interested in knowing more about graduate school and research but that's something I should have known about a long time ago.

At the time of this interview Matthew was coming to the end of his undergraduate career. He was feeling the stress from not securing a job prior to graduation. He references the lack of resources such as specialized labs, which provide necessary experience that his university does not have. He also mentioned not knowing about graduate school until the time of this interview. Prior to our interview I gave a brief talk in his Advanced Computer Networking course where I mentioned Research Experience for Undergraduates (REU). The National Science Foundation in conjunction with host sites funds the REU program. I shared an experience where I mentored about ten undergraduate students through an REU program. The REU program allows students to work on a specific project and allows them to become acquainted with graduate school level research while they are undergraduates. As a follow-up to this interview Matthew did ultimately go to graduate school for his Masters and graduated in 2014.

Another example of the type of institution theme emerged during an interview with Aaron. Aaron is a 19-year-old junior at a PWI. He was raised by his Mom in a predominately

Black neighborhood in South Carolina. He attended predominately Black schools throughout his life. He references how a student needs to make the most out of the resources and opportunities afforded to them.

I believe the college provides everything we need to be successful. You have to make sure you go out there and make the best out of the opportunities. If you don't go to the seminars and job fairs, then you won't be prepared. While most things are optional, I consider them as mandatory. There's no one that's going to hand everything to you. If there's one thing that you learn at a PWI is that you need to fend for yourself. I look at it as putting myself in a position to succeed. There are countless people and resources that I can use but I have to take advantage of them. It's about more than just going to class and passing.

The difference between Matthew and Aaron may be contributed to the type of institution or the type of personality that they have. Aaron seems to be more familiar with resources and how to use them to his advantage. Matthew on the other hand sees a lack of resources, which may or may not be true of the resources available.

Theme Two: Preparation for the IT Field

The second theme was preparation for the IT field. The level to which a student felt prepared for the workforce was a theme that emerged. Some of the interviewees discussed their career path post-graduation while others lacked a formal, and sometimes informal, plan for what occurs after graduation. In addition to which direction to pursue post-graduation there were several participants who did not have a background in doing IT work prior to enrolling in their

major. This lack of adequate preparation could be a reason why some do not select IT as a possible major. If the student's experience is with gaming do they have an understanding of the mathematical concepts and other core foundational skills that go into Computer Science prior to declaring it as their major? An example of this theme where a participant did not know what he would encounter occurred with Jackson. Jackson is an 18-year-old sophomore at a PWI. He was raised by his Mom in a predominately Black neighborhood in Florida.

Trying to get help in class! I don't see how you did it. It's a pain trying to get help. Sometimes I wonder if they even want me to succeed. I am trying but we have professors that don't even know your name. How is it possible that you can't remember the only person of color in the classroom? I'm in classrooms with over 50 students. It's hard to get some individual attention. We have minority support groups like NSBE but it's a little hard to feel like I chose the right major.

Jackson mentions one key differentiator between the HBCU and PWI students and that's the size of classes. In a PWI the interviewees are more likely to mention that individualized instruction and help is harder to come by than HBCU students. The HBCU students have a lower student to instructor ratio. He receives some support from the National Society of Black Engineering (NSBE). He is questioning whether he chose the right major, which could lead to attrition if he does not feel as if he belongs in the field. As a sophomore who may be beginning his major coursework he may feel more pressure to succeed and without a solid support group it may lead him to change his major.

An alternate example of this theme where a participant did not do what he would encounter occurred with Christopher. Christopher is a 19-year-old junior at an HBCU. He attended a mixed background high school.

I feel like I can speak up and not be judged. It's almost like no question is a stupid question. In high school I would be afraid of speaking up but here is like we're all the same in a sense. Usually when I ask a question someone else chimes in and says that they were wondering the same thing. It's almost like reassurance that I haven't completely lost my mind. Getting the help I need is an added benefit from study groups to going to the professor. I would think if I went to a PWI I would have a wider range of courses to choose from but as long as I'm getting what I need then I don't think that matters much. I know from talking to my friends that went to a PWI that sometimes having 1 on 1 attention can be tough. They also have teaching assistants which I think would be nice to have since they are sometimes younger and can relate a bit more but on the other hand they are an additional layer in the way of getting to the actual professor.

Christopher spoke to how he believes that his education at the HBCU was substantive enough to prepare him for the IT field. He then acknowledges that there would be some differences between the type of education received at an HBCU and that of a PWI. He does not believe that the difference would be substantial and that he prefers some of the individual attention of the HBCU and how there seems to be fewer levels of complexity in seeking individual attention from the professors.

Theme Three: Role of Advising

The third theme was the role of advising. Understanding some of the barriers that Black males faced trying to identify with the IT field and find an advisor that identified with them was of particular interest. Advising students in an academic capacity and a mentoring capacity is key to development and future success. Having an advisor that understands a student on a fundamental and personal level can lead to additional insight, which may help the advisor-student relationship. There were several respondents that mentioned the role of advising. In some interviews the participants mentioned not being able to reliably contact their advisor and setting up meetings can take several weeks. On the other hand there were examples of where a participant's advisor was readily available to provide both professional and personal advice. In some examples there was conflicting information provided by different advisors. An example of this theme emerged with Benjamin. Benjamin is a 20-year-old junior at a PWI. He was raised in a predominately Black neighborhood in Georgia with both parents. He attended predominately Black schools until he got to college.

Here we have multiple advisors. We have one within the college and we also have an academic advisor. Sometimes I feel like I am being told conflicting information. One is White because my college makeup is mostly White and he was assigned to me when I declared my major. The other in the [redacted] is Black. I do not feel like the college advisor cares much about me as a person. I see him spend a lot of time with other White students but his meetings with me are 10 minutes. I just don't think he can relate to me. On the other hand my Black advisor will spend hours talking to me but he does not know much about the IT field and careers that appeal to me. He can provide life experience but I need

more than that to be successful. We talked about people in my life that I don't want to be like and help ensuring that I made decisions to not be like them.

Benjamin references his academic unit advisor and a multicultural advisor. He discusses at length some of the perceived shortcomings of the academic advisor. He talks about how he does not feel a connection to his academic advisor. Meanwhile his multicultural advisor and he do share a connection but there's a skill set limitation because he is not familiar with Benjamin's field. A lack of belonging within the IT field did not cause Benjamin to leave the college but it does hinder the successful facilitation of communication, which is a key to success.

Another example of this theme emerged with John. John is an 18-year-old sophomore at a HBCU. He was raised in a predominately Black neighborhood in Missouri with both parents. He attended a predominately Black school high school.

I love my advisor. When I first arrived we had assigned advisors but after the first year we got to choose one who we thought matched with our desires for our career. I'm glad I got mine because the relationship extends beyond just advising. If I miss a class and I don't let him know he checks on me. If I'm acting out, and i'm an outgoing person, if it reflects negatively and he's around he lets me know. When I wanted to join a fraternity, when he found out he pulled me aside and laid down the ground rules. I don't need any other parents in my life but it's good to know that I have someone who cares about my well-being. He's someone I can lookup to and I'm sure our relationship will continue after I graduate.

John outlined his experience with his advisor. Their relationship is professional although this advisor does also care about his well being personally as well. He referenced having someone that he actually likes and that connects with him on a granular level. Their relationship will likely extend beyond graduation.

Key Findings	
Examples	Summary
Type of Institution	The type of institution the interviewees attended was a topic. Some referenced more resources for career placement and a larger variety of courses to choose from to gain experience. Others referenced larger or smaller classroom sizes and their inability to receive one-on-one instruction from a professor.
Preparation for the IT Field	Interviewees experienced varying degrees of what they perceived to be preparation for the IT field. Those who participated in internships felt more prepared because they experienced what the work would be like. Those who did not experience an internship used insight from friends and faculty to interpret what work in the IT field would be similar to.
Role of Advising	The role of advising for Black men was a topic that consistent among the interviewees. At some institutions the students had an academic advisor and multicultural advisor. They would reference the difficulty in scheduling and meeting with advisors. Others would mention how much of a help their advisor had been towards shaping the IT professional they hope to become post-graduation.

Table 5-7. Key Findings from Research Question 3

Chapter Conclusion

These results highlight Black male individual, societal and institutional characteristics on the road to IT degree attainment. Many of these men experience similar influences such as identity affiliation with the field, challenging stereotypes, the role of family, the role of advising and finding the necessary resources to be successful. However, the overarching theme is that these men did succeed in overcoming those obstacles to obtain their IT degree.

The constructs of the theory were used to analyze interview data on the presence of stereotypes and coping mechanisms of Black males who are studying IT education. The individual influences construct relates to stereotypes about personal characteristics (i.e. personality). The individual identity constructs highlighted stereotypes related to race (i.e. ethnicity). The societal messages presented stereotypes coming from the societal climate.

The stereotypes identified by the interviewees align closely with the first author's personal experiences attending an HBCU for undergraduate school and then transitioning to a PWI for graduate education. Often times there was a sense of needing to combat stereotypes whether they presented themselves or not (i.e. stereotype threat). There was a sense of needing to prove oneself so as not to succumb to popular pop culture stereotypes and media stereotypes that correlate Black males to being lazy and ignorant.

Black males seemed to sense that White students did not feel the need to prove anything, since they were already the dominant in the IT field. The interviewees attending a PWI made similar remarks about being marginalized because of so few Black students and faculty. Conversely, the students attending HBCUs spoke about stereotypes being attached to outside

environmental factors (i.e. workplace environment). The lack of people of similar ethnicity and upbringing makes it difficult to feel welcomed into the field, something that leads to feelings of empowerment.

While there are several factors that influence degree attainment, knowing which are particular to Black men can lead us to understanding their individual needs and assist with recruitment and retention efforts. There is evidence that supports the need for increased diversity in IT. Top Silicon Valley companies, Fortune 500 Companies and research show that a diverse workforce is needed to develop innovative solutions.

As researchers there's a need to cultivate the minority population and assist with the removal or successful navigation of obstacles. There results indicate a small piece of that successful navigation. These results indicate that people will have individual routes to their success but after studying several you can begin to see how these common themes manifest themselves into successful traits. One can also begin to identify areas of which to position for future research, interventions and policy making.

Chapter 6 - Reflexivity - Voice of the Researcher

This chapter cycles back through the results that were presented in chapter 5. This chapter serves as the voice of the researcher and details how I dealt with the circumstances that the participants encountered during my time in school and work. I will arrange this chapter similar to chapter 5 with sub headings for each of the themes.

Race

Jacob's comment resonates with me on a few different levels. There are internal and external factors that influenced how I got to be in a position where I am writing a dissertation. When I reflect over my time as an undergraduate and going back home during the summer months, I could not wait to go back to school. My desire to get back to school was not for the education but rather to leave an area where I no longer felt like I fit. When faced with a decision whether to stay or go back to school, the decision was simple. In regards to race, this was something I did not notice until my first internship. I was raised in a predominately Black neighborhood in Southwest Atlanta. The schools I attended were primarily Black. Attending an HBCU for undergraduate education felt natural because the demographics of the university were the same as my upbringing. However, my first internship opened my eyes to the reality that the field that I was entering was the opposite of what I had been accustomed to. The adjustment was difficult because I did not feel like I could be myself and be treated fairly. Not only was I a Black male but I was also young.

Age

Personally, age was a factor in terms of experience. During my internships and work experience the positions placed emphasis on years in role. Experience plays a factor and while education is critical, experience is just as crucial. While education and experience are important in the IT field family is also important and provides social stability.

Family

Family was critical during my time in school. They are very supportive of my decision to pursue Computer Science even though, at the time, they did not know much about it. I am the first member of my immediate family to pursue IT as a career goal. They encouraged me to do well even though they were not as familiar with the details of the work I was doing or the courses I was taking. In particular, my Dad got me interested in computers. He built the first one I owned. I promptly destroyed it, mistakenly of course. Each time he would visit he spent time repairing my destruction. He introduced me to dial-up Internet. I would spend hours on it. My Grandmother would have to persuade me to get offline so she could use the phone. I found the technology to be cool. I went to a high school that was a Mathematics and Science Magnet school. There were few computers in the school but I recall taking a C++ course while I was there. I believe I did more teaching the teacher than anything else but I became known as the go-to person for all computing needs. While I was learning some components needed to be successful in IT there was also a need to acclimate to the IT field.

Fatherhood is an area that I struggle with the most, even as I write this document. I was in the second year of my graduate program at The Pennsylvania State University when my daughter was born. Her mother and I were not together at the time. This posed a unique and challenging

situation for me. While I am in the process of transcribing and coding interview data about the Black of fathers in young men's lives, here I was living five hundred miles away from my daughter. However, over the next 3 years, I was able to gain some insight into being a father and the issues that emerged while conducting this research. The interviewees mentioned presence several times. The notion of presence is complex. There are many ways in which fathers support their children. One of the most obvious is financial support. However, in my experience, financial support is not the greatest factor. From my brief time as a father, I find that monetary support is necessary but it alone is not sufficient. There are varying degrees of presence. In my situation, I am not geographically close to my daughter. This means that I sometimes go months at a time without seeing her physically. I did not know how critical this was until I visited her once and there was this time period of acclimation. It was as if she had to feel comfortable around me again and that was awkward. Her mother and I had to come up with ways to ensure that was not an issue moving forward. Luckily with the advent of emerging technology video calling is now an option. So when my daughter says, "I want to talk to daddy", I am readily available. The parental relationships between mother and father play a critical role in a child's upbringing. From my experience, consistency in a child's life should help with the lack of physical presence. Now when I visit my daughter, she knows that I am coming. She marks off days on her calendar. The last time I visited her, she picked out her own princess outfit that she wanted to wear for when I arrived. Just the sheer excitement from when I was walking up the driveway and I could see her standing at the front door jumping for joy helped me to know that I may have done something right.

Reflecting on presence even more brings me back to my youth. My dad was a military serviceman. He spent 28 years in the Air Force. He retired in 2010 as a Chief Master Sergeant

(CMSgt). The CMSgt rank is the highest enlisted rank in the U.S. Air Force and a rank that by federal law is limited to roughly one percent of enlisted Air Force personnel. I have an older brother who is two years older than I. My dad and mom were split up shortly after I was born. My mother is a phlebotomist and travels a lot for work. When my brother and I were young, in the early 1990s before video conferencing became omnipresent, my dad visited us regularly at my grandmother's house. I do not remember my dad visiting as often as my brother does. For some reason I simply cannot recall those times. Also, since my dad was often deployed or away on temporary duty (TDY) there would be times where we would go without seeing him. He did make it a habit to call twice a month to talk to us. In addition, we spent the summers with him in Virginia while he was stationed at Langley Air Force Base. This was one way that my dad coped with the issue of presence. This was before the mass distribution of video conferencing technology.

Recently, I was talking with dad in his kitchen enjoying some adult beverages and I brought up how I did not remember those times that he would visit. I explained to him that I feel like I should remember those times and how I did not understand how my brother who is only two years older than me remembers but I did not. He went on to explain that when he and my mother split I was very young and early in my developmental stages. He said that the hardest thing he ever had to do was leave his children and how much it hurt him to do so but he had to do so for himself and for us. This really resonated with me because I found myself in the same situation. I look up to my dad. He is not just my father but one of my best friends. He mentioned recently that I did not have to listen anymore, referencing the fact that I am an adult and older. However, there's no discounting the fact that the advice he has provided, even when he says, "I'm all out of fatherly advice", has been instrumental in shaping me into who I am today.

IT Identity

I found it difficult to adjust to the reality that IT is not a field that many Blacks go into. Going from an HBCU to a PWI was a difficult transition. When I searched for a graduate school, I looked specifically for Black faculty members. My hope was that a Black faculty member might better understand my lived experiences. During my time at Auburn University, there was a sense of belonging because the two labs that I participated in were predominately Black and had Black Principal Investigators. It was during this time that I began to notice the impact that Black professors had on Black students. It was motivating in a sense that I saw others that were like me excelling in this field. It was during this time that we built a sense of family among us to help each other out in classes and projects. We often stayed in the labs late and attended classes together. We presented at conferences together and traveled together. We slowly began to forget about race. In a way, we created our own IT Identity and did not adapt to the prevailing White male concentrated identity.

The notion of IT identity was discussed in terms of race and a feeling of belonging within the field. The participants mentioned that the lack of Black faculty members coupled with being underrepresented in the field inhibited their ability to feel as if the IT field was welcoming to minorities. This was a similar sentiment that I faced when pursuing my undergraduate education at an HBCU. I did not feel as if I belonged and this feeling was intensified after completing several internships where I would be the only minority in the room. For the past four years I have worked as an IT manager for a Fortune 100 company that specializes in consumer electronics. While the company has over 900 “big boxes” or large retail format stores, I work within the corporate umbrellas as opposed to retail. In addition to IT management, I have worked in a cross collaboration and coordination capacity with internal and external stakeholders that include:

Vendor Content Development Managers, Trainer, Services and Retail Training Managers, Vendor Relationship Managers and Design, Operations, Quality, Project and Work Force Management Teams. This company advertises its commitment to diversity. In fact, there was a recent virtual learning that is required by all company employees covering Diversity and Inclusion. During my time with this company I worked as a District Manager with multiple markets throughout the northeast and mid-Atlantic parts of the United States. It was during this time that I noticed a corporation that is grappling to understand the value and need for diversity in every business sector.

The same sentiment that I felt when in undergraduate school and the sentiment shared by interviewees has persisted through time. Alternatively, some of the participants were able to more easily identify with the IT field because they had friends and siblings who had entered IT. Since they were surrounded by the field and knew someone who was in it they were able to understand the background of the field to make their transition easier than someone who had not previously been introduced to IT prior to declaring the major.

IT Exposure

In my experience exposure and comfort have a direct correlation in the IT field. As you increase exposure, you increase comfort. Exposure and comfort is what it takes to overcome obstacles that hinder success. Had I not been exposed at an early age to technology, my comfort level with it would not have been as extensive. Had I not had the internship where I was exposed to the IT being White male dominated, I may not have felt as comfortable entering the field. This exposure made a significant difference in my adaptation to IT. The notion of obstacles is one that

I do not believe is reserved only for Blacks. This is something that women and Latinos in IT face as well. There are also similar examples in other fields and in daily life.

Stereotypes and Stereotype Threat

I recall a time when a Black professor stereotyped me as lazy and “ghetto” by the type of clothes I wore. It was not until I asked for a favor after excelling in class that I was informed that these were the first impressions that the professor had of me. In my mind, I wore the clothes because they were relatively inexpensive. I did not know a screen-printed t-shirt from the clearance rack at Wal-Mart carried so much weight. It was the first time that I experienced being viewed as a stereotype. That single experience made me hypersensitive to what others may have also thought. I found myself wanting to prove others wrong because of what I thought they might have also stereotyped me as. I began to take the lead on more projects, sit in the front of classrooms, only wear collared shirts with no visible logos, change my sneakers for casual shoes and attend sessions that I would otherwise not attend. It was not until years later that I realized I there was a term for my response; stereotype threat.

While attending an HBCU, I believe I was sheltered from stereotypes because the majority of the faculty and students were Black. Stereotypes did not begin to present themselves until I began participating in internships and proceeded into graduate school. I recall my first internship as a database administrator where my White colleagues assumed I did not have the educational background to successfully redesign an antiquated record keeping system. I felt the need to disprove his critics. It was at that time that he began to notice differences between the Black male students and majority students. It was not until graduate school that he felt the pressure to conform to what the majority students did and distance himself from his own identity

as a method to combat stereotypes. In similar fashion, issues of stereotypes also presented themselves in the interviews. Students at both PWIs and HBCUs have felt marginalized. Despite these issues, the interviewed Black males are continuing their education in IT. These findings give evidence that more research has to be done to identify ways to combat marginalization of Black males in the IT. With the benefit of these findings we will be able to better create future interventions.

Societal Messages

The societal messages are ever present to Black males. Like Michael, I know people, who I once considered friends that are doing the same things back home that they were doing in the early 2000s. They talk about wanting to do better for themselves but cannot break the bad habits that keep them in their situation. When they try to break out and do something new they do not have the persistence to stick with it and ultimately revert back to what they feel comfortable doing. Overcoming is necessary to try new things that could lead to an improved quality of life. These are the type of individuals who could benefit from having role models.

Role Models

The necessity for role models for Black males cannot be understated. I was lucky to have several role models in my life. It really did take a village to raise me. My Mom served as a role model because she had gone to trade school to be trained as a phlebotomist. She never let me become complacent. She was a single mother raising two children. We were her motivation to do better, maybe not for her, but for her children. My Dad was a role model; he spent 28 years in the Air Force. He retired as a Chief Master Sergeant. He got me involved in technology at a young

age and spent time showing me how to build and repair computers while I was in middle school. My Grandmother was a role model and she helped raise me. She worked for General Motors. Each morning she got up at 4 am to get ready for work. She would call me in the morning during the assembly line break to make sure I was up getting ready for school and to make sure I ate the breakfast she left in the microwave.

My Auntie was a role model. She lives next door to my Grandmother. She graduated from Clark College and went on to get her Masters from Atlanta University. She was accepted into UCLA for graduate school but opted to stay in Atlanta due to her father's declining health. She was my medic, my tutor and my creative inspiration. She helped with every science project. My brother was a role model because he was the smart kid. He knew everything. I was simply trying my best to keep up with him. These are just some of the few people who I looked to as role models and were instrumental to ensure I stayed grounded and ensured I was doing the right things. Even with people encouraging me to live up to my potential there were institutional factors at play.

Type of Institution

In my experience, there was quite a difference in the teaching HBCU and research PWIs that I attended. The HBCU, which was teaching focused, offered smaller course sizes and more one-on-one attention from my advisor. One of the core missions of the college was to lure companies to the campus to hire students immediately after graduation. However, there was little focus on research and graduate school. At the PWI, which was research intensive, the core of educational model centered on the research that was occurring. It was there where I learned more about the research process, publishing and presenting. While there was nothing particularly

insufficient about either, it would have been beneficial to know which trajectory I wanted to pursue before attending the school.

Having attended both types of institutions I can identify with the students from each. Attending an HBCU left me eager to learn what I may have been missing by not attending a PWI, whether it is resources, in regards to upgraded facilities and college partnerships with companies, to more diverse course availability or the name recognition of a well renowned institution. When I compared some undergraduate courses at the HBCU that I attended to undergraduate courses at the two PWI universities I attended for graduate education, I noticed a much greater student-to-professor ratio at both PWIs. While there was individual attention that could be provided at each university that I attended there was a family sense between professor and student at the HBCU, which was not evident at either PWI.

While attending an HBCU, I did not notice race as a factor. Most of the faculty and staff were underrepresented. While there were aspects that were different we shared the commonality of being a minority. It was not until I moved on to graduate school where I began to feel like an outsider even though I was in a field that I studied and excelled in. It was during this time that I began to doubt my abilities and question if I was ready for graduate school. I lacked the institutional pedigree of some of my peers, which brought into question my preparedness for my field. I began to notice that I could not carry myself in the same way that I did for undergraduate for fear of being stereotyped. Where I was once vocal in the classroom and asked questions, I felt myself more resigned to sitting in silence for fear that my question may reveal that maybe I did not really belong in the class. I struggled with my own identity as being the technological child who ruled the IT domain to one that felt out of place. Students at both PWIs and HBCUs have felt marginalized.

Support Groups

Support groups can be key to success especially when there are identity affiliation issues. I am active in NSBE, which can be a good resource for Blacks. There are also inter-college support groups for people of color. Talking to others who are upperclassmen can help overcome the sense of not belonging. During my time at Auburn I used the labs as a support group since many of the members already took classes that I was enrolled in or would soon take. I learned from them to try to better understand the intricacies of graduate school being a system that is not as well defined as undergrad. At large institutions it can be difficult to get one-on-one attention but there are ways to combat reaching out to advisors or teaching assistants for assistance. There's also a level of persistence that I had to stick with the class and major even when things got challenging.

The Role of Advising

The role of advising is often overlooked. In my academic career I have had five academic advisors. Their role in guiding me academically, professionally and personally has been instrumental in my success. I circumvented the need to have a multicultural advisor by always having an advisor that related to me on a personal level. There has been some questionable advice that was given, particularly at the undergraduate level but the advice that I received at the graduate level has helped to shape who I have become. It's easy to understand how having advisors that have competing views can pull a student in different directions. There's also an issue with having something in common, in the case of myself it was usually an aspect of being underrepresented either by race or sex. My advisors have been more than just academic advisors- they have become mentors and people who I look to for guidance. The impact that mine have

had on my career cannot be minimized. I would not be where I am today without them. Had I not had a few that were minorities, I may not have had the opportunity to discuss this topic.

Chapter 7 - Discussion

The results presented in this dissertation only begin to help us understand Black male adoption of the IT field. Other research is being conducted to identify other issues influencing Black male participation in IT (Trauth, Cain, Joshi, Kvasny and Booth, forthcoming; Fuller, Kvasny and Trauth, 2015; Kvasny, Joshi and Trauth, 2015). The purpose of this research project was to identify obstacles that Black males encounter when choosing a career in IT and how they overcome those obstacles. An interpretative based research investigation was launched conducting interviews with 30 participants who are Black males attending either an Historically Black College and University (HBCU) or a Predominately White Institution (PWI). The results of this study demonstrated that there are variations among Black men based on various factors that influence behavior and perspectives related to the IT field. This chapter opens with a summary of the key findings. Following that, discussions about the evaluation and contribution of the finding are presented.

Key Findings

Research Question 1

The first research question in this study was “How do Black male Individual Characteristics influence IT degree pursuit and attainment?” The Individual Differences Theory of Gender and IT guided this research project. The constructs of the theory for this research question that were explored were personal demographics and type of IT work. The categories

that presented themselves throughout the interviews were related to race, age, family, IT identity and gender identity.

While exploring the personal demographics construct the participants at both institutions were frustrated that race played an integral part in personal and career development. This was a frustration shared between HBCU and PWI students. HBCU students referenced race while they were conducting their internships. The PWI students referenced frustration with race during their coursework and roles in team projects as well as during internships. Among the interviewees they referenced race playing a role in team and group based assignments, particularly among the students attending the PWI, where they feel as if they were given less critical roles on projects such as creating the bibliography, which emphasizes an intelligence stereotype about Black men. They mention racial identity as playing a role in their experiences during internships and feeling alone. While this issue of isolation and group isolation was a frustration there was a sentiment to not allow it to be a hindrance. The interviewees at both the PWI and HBCU were aware that the IT workforce is primarily White and Asian males. They mentioned that trying to feel a part of the field would be difficult. The participants referenced the need to adjust how they present themselves in the classroom and professionally to fit into the dominant IT culture. However, the interviewees were determined to make IT their chosen profession.

Age was also an important factor. In this study the participants were traditional college aged. Traditional college aged references students who entered undergraduate immediately after completing high school. None of the participants had begun their career or had work experience in the field prior to entering college.

Family was another important factor for these men to choose IT as a profession. All of the interviewees referenced at least one family member as a motivational resource for their

continued pursuit of an IT career. For many of the participants they referenced a close family member such as a parent, grandparent or sibling. There were that five interviewees that identified themselves as fathers and having a child while they were in either high school or college. These fathers, who all shared joint custody of their children, referred to a career in IT as a way to make a sustainable income for their children to be in a better financial situation as well as have a father present that some of these men did not have while they were being raised. Some of the fathers were in relationships with their child's mother and they saw their child on a daily basis. Others had children in other areas and they saw their children nearly every weekend. These men see IT as a field that is growing and the likelihood that the income revenue stream will continue for several decades was a safe bet. The majority of participants came from single parent households where the mother was the primary caregiver. In many cases there was a strong belief in the need for a solid family presence through grandparents, siblings and older family members.

Research Question 2

The second research question in this study was “In which ways do Black males cope with societal characteristics that influence IT degree pursuit and attainment?” The constructs of the theory that were explored were personal demographics, personal characteristics and personal influences. The examples that were extrapolated from the interviews were related to stereotypes, stereotype threat and significant others.

When discussing some of the barriers to acclimating to IT work the participants mentioned the need to overcome stereotypes, particularly at the PWI. Some stereotypes that the interviewees described were being identified as lazy, not as intelligent as their peers and

incapable of leading. The stereotypes were highlighted when the participants would be given lesser roles on teams. When faced with these stereotypes all the participants referenced a desire to disprove them. The way in which they tried to dispel these stereotypes was by arriving early to class and team meeting sessions, excelling in coursework and taking on lead positions on group projects in school as well as during internships. The participants attending the PWI felt as if they had to work harder to receive favorable consideration from professors in their studies. The students at both the PWI and HBCU experienced marginalization during their internship programs.

In addition to stereotypes there were many instances of stereotype threat at both the PWI and HBCU. Stereotype threat appeared when I would ask the question of how the participants recognized stereotypes. There were instances where these Black men would enter a classroom, participate in a group project or internship where they felt themselves being in a situation where they were at risk of potentially confirming a stereotype about Black men. In regards to stereotypes in the classroom, this occurred more prominently at the PWI as opposed to the HBCU. For example, William struggled in Mathematics. He was the only Black student in his class. He felt by him asking for help that he would confirm the stereotype that Blacks are poor performers in mathematics. This is a similar issue that James ran into in his programming course where he needed additional help. He was afraid to ask for help from his professor and White peers for fear that he was the only person struggling with concepts that he felt others were grasping easily. It is the combination of stereotypes and stereotype threat that creates a culture where these Black men do not feel welcomed because they have to continuously prove their worth. Both William and James were students at the PWI.

Additionally, there were stereotypes at the HBCU as well. Overall, traditional stereotypes

at the HBCU revealed themselves outside of the university. For example, Mason referenced stereotypes that he felt were present during his internship. He believes that some of the more tenured IT professionals at his internship felt he was not adequately prepared which reveal some doubt about intellectual capacity. Mason mentioned that he's used to being a pretty smart kid but during his internship he began to doubt himself. His doubt, despite his achievements, could be attributed to his internship being the first time that he stepped outside the HBCU to work. This experience exposed him to the reality that he's underrepresented in his field as opposed to when he's in school. Andrew, who's a senior at the HBCU referenced a different type of stereotype, one that was internal at the HBCU. He talked about students in his college being described as egotistic. When asked to elaborate, he explained that STEM students are supposed to be intellectual superior to students in other colleges. He did not feel as if he fit that description. He was open in stating that he has never been the smartest person in the room but felt as if he didn't perform he would be letting other STEM students down. This type of stereotype despite race was revealing. It shows that even one's own race may hold stereotypes about their own depending on their chosen degree path. The presence of internal stereotypes was a surprise finding. Andrew's interpretation of stereotypes was not as widespread among participants as external stereotypes but reveals one that should be further pursued.

According to Gasman and Commodore (2014) stereotypes exist about HBCUs. One of the stereotypes is that HBCUs are less rigorous than PWIs. If Mason internalized that stereotype that could lead him to doubt his abilities to perform the work that would be required of an IT professional. However, the concept of rigor is subjective. There are no absolute criteria to gauge a program's rigor. To say that Mason would have been less successful at a PWI would be a misrepresented generalization. The idea that a PWI is of quality because it is majority White

would be an assumption. According to a Gallup and Perdue University poll graduates of HBCUs are significantly more likely to be supported while in college and thriving economically, socially and physically than Black students that graduate from PWIs (Seymour and Ray, 2015).

Another key finding was the presence of messages from significant others. Participants encountered messages about why they should not enter the IT field. Some of the messages came from teachers while others came from people who they knew while growing up. These messages were typically negative and tried to dissuade the males from going into the IT field. In some cases friends whom they grew up with criticized the interviewees for leaving the area in which they were raised in search of a brighter future. The end result of these messages varied. Some participants have no desire to go back to the neighborhood that they were raised because they did not see the need. Others have a desire to go back to attempt to provide an alternate lens for youth to understand that a career in IT is possible. I recall a time when I received a message from a Black magnet school coordinator where she stated that I was not smart enough to take an AP Biology course that I wanted to enroll in. That message stuck with me, not because she was right, but because of who she was and her influence in the lives of all the magnet program's students.

The final major finding from the second research question was the presence of significant others. Role models and mentors fall into the significant others category. The participants referenced specific family members, friends and teachers as role models. They referenced guidance counselors and IT professionals as mentors. These significant others were instrumental in the success of these Black men. From my own upbringing there was a gentleman who owned his own IT company. It was through that company that I developed the skill necessary to diagnose, troubleshoot and repair computers while I was in high school. It was that insight which

instilled confidence in me that I could pursue IT as a career. Prior to that occurring I believed that I would go to school for something in the natural sciences.

Research Question 3

The third research question in this study was “How do Institutional Characteristics encountered by Black males influence IT degree pursuit and attainment?” The third construct of the theory is environment. The sub construct that was explored is the institutional culture. The examples that were gathered from the interviews were related to the type of institution, preparation for the IT field and the role of advising.

The type of institution, HBCU or PWI, was significant because of the contrasting types of universities. The PWI is located in a mostly rural area of Pennsylvania while the HBCU is located in an urban area of North Carolina. Another difference is the student population. The PWI is a large campus serving undergraduate and graduate degrees with a large student population. The HBCU is smaller serving only undergraduate degrees to a much smaller student population. I asked the students attending the PWI how they feel their experience may have changed had they attended an HBCU and vice versa to the students attending the HBCU. Some of Black males attending the PWI believed students attending the HBCU received more one-on-one instruction. They also felt like they would have been able to surround themselves with more Black students and faculty who may share some commonalities with them than they found at the PWI. The students who attended the HBU felt like they would have had more access to advanced courses and resources had they attended a PWI. The most important takeaway was that all

students acknowledged some inherent value with not only the school they attended but the other as well.

Another example that emerged was preparation for the IT field. The interviewees mentioned that their respective institutions placed an emphasis on preparation for the IT field but the degree to which the students felt prepared seemed to differ. The students who attended the PWI felt as if they were most prepared for a career in IT after completing their degree. Their confidence came from the fact that they did take an abundant number of rigorous courses but they also had an internship requirement before graduation. The internship that they participated in allowed them to gain initial experience in their field, which led to creating familiarity with their work prior to graduation. At the HBCU there were rigorous courses but there was not an internship requirement before graduation. While internships are greatly emphasized and there are various types of support structures in place to help acquire an internship they are not required. Some of the students referenced the fact that they were not required to get an internship and thus with graduation nearing they do not feel as confident as they would have had they been exposed to that experience during their collegiate years, which is a function of the curriculum. There are several HBCUs that have an internship requirement as part of the curriculum.

The final major finding from the third research question was the role of advising. The PWI participants experienced a challenging advising situation. There were multicultural offices within the college, multicultural advisors and academic advisors. The students expressed some concern with being told different things by their two advisors and being put in a situation to decide which path to take. They also did not feel a close bond to their academic advisor due to the lack of identity affiliation. They were often taking life and personal advice from their multicultural advisor and professional advice from their academic advisor. They referenced

difficulty with scheduling time to meet with their academic advisor, being rushed during their conversations and brushed off. Scheduling time with advisors could be a commonality across all students because of the increased number of students to advisors. This is different than at the HBCU where there was a multicultural advising office for the STEM colleges in addition to their academic advisor.

They felt a close-knit bond to the advisors who knew them personally. In this regard the advisee-advisor relationship at the HBCU seems to be more fluid and natural. In my time as a student I have had closer relationships with my academic advisor at the graduate level than at the undergraduate level. My advisor is a White woman but we share many commonalities. One of the commonalities that we share is that we are both minorities. My advisor also is a minority in regards to her sexual orientation. Another area of commonality is our research area studying socio-cultural and organizational influences on IT, more specifically under represented groups in the IT workforce. Some of the issues experienced may be attributed to time attributed to the size of the institution and whether one is at the graduate or undergraduate level more so than race.

The ultimate goal of this research is to add to the body of knowledge about minority group's participation in IT. One approach, which is the one presented in this dissertation, studies not only ethnicity, but also gender as a method to understand IT participation. The findings of this research have implications for interventions and future research, which would lead to a better understanding of the factors influencing marginalization and subsequent underrepresentation of Black males in IT. Through qualitative inquiry, we identified some of the issues facing Black males. The findings from this study will add to the growing body of knowledge of minority groups within the IT field and inform subsequent interventions.

The findings of the study suggest three insights about Black males pursuing IT degrees. The insights are the role advising, IT identity and stereotype threat. The issues identified by the interviewees align closely with my personal experiences attending a HBCU and transitioning to a PWI for graduate education. Often times there was a sense of not belonging due to the dearth of Black students and faculty members. There were certainly times where ethnic differences played a role in a lack of communication between Black and majority students. The interviewees attending PWIs made similar remarks about being marginalized because of so few Black students and faculty. Conversely, the students attending HBCUs spoke about being attached to their advisors who assisted them academically and professionally. The lack of people of similar ethnicity and upbringing makes it difficult to feel welcomed into the field, which leads to not feeling empowered.

Despite these issues, the interviewed Black males are continuing their education in IT. These findings give evidence that more research has to be done to identify ways to combat marginalization of Black males in the IT field.

Criteria for Evaluating Quality of the Findings

In conducting this research project, rigor was sought to add to the believability of the results. In the discussion of the evaluation of interpretive results, Trauth (2000) describes how a researcher must look for alternatives to methods of validity and reliability. To bolster believability and rigor for interpretative research, I used member checking where I received feedback from reviewers of conference papers. Focus groups were conducted where I presented findings to Black males either in IT or pursuing a degree in IT in an effort to gain additional

insight and to ensure the findings were consistent with their experiences. Minority focused conferences such as Tapia Diversity in Computing and The PhD Project Information Systems Doctoral Students Association were venues where I spoke about the research to gain additional insight. In addition to those, reflexivity was also used. Klein and Myers (1999) designed seven ways which to evaluate interpretative field studies some of which were utilized in this study. The criteria for evaluation used in this study can be found below in Table 6.

One principle for evaluation is The Fundamental Principle of the Hermeneutic Circle, which is iterating between the interdependent meaning of parts and the whole that they formed. In essence, this means that each participant should be looked at on two distinct levels, the individual level and the group level since their contribution to the research is to both. This principle was demonstrated in this study by individually evaluating responses from the participant and grouping them into the larger societal context. Additionally, member checking and focus groups allowed me to step outside of the primary interviewee responses and present research to those within the participant group and those outside for validation of experiences.

The second principle for evaluation is The Principle of Contextualization, which requires reflection on the social and historical background of the research setting. This principle allows for the audience to understand how the situation being investigated emerged. To set the proper context I ensured the interviewees knew about the type of research that was being conducted. The research was described in the recruitment script. The participants knew how their data would be used in dissemination of the research results as well as asked if they would participate in future research studies emerging from this project, to which they all agreed.

The third principle of evaluation is the interaction between the researcher and the subjects. During my research study this is where reflexivity became critical. I am in a unique

position because I have experienced what my research subjects were going through. I bring my lived experience to the research and it is important that it be accounted for and discussed throughout the results. I am able to provide additional context because of my lived experiences and I am able to empathize with the interview participants. However, throughout conducting this research I had to be cognizant and reflect on assumptions, about why I felt marginalization in the field, that I had experienced and their role in conveying the research to the participants. One way that I remained cognizant was to provide personal narratives about my experiences, which did not always align with the participants in this study.

The fourth principle is the Principle of Multiple Interpretations, which is the possibility the multiple interpretations of the data that a researcher could develop. One method to account for this principle is member checking. In this study I presented this research to members of the underrepresented community through minority focused conferences* and also published this research in many peer-reviewed conferences#. Another example of the multiple interpretations is how experiences differ between HBCU and PWI students, not only lived experiences, but academic experiences including advising.

The final principle is the Principle of Suspicion. This principle requires sensitivity to possible biases and systematic distortions in narratives collected from the participants. To account for this principle, reflexivity was used to dialog and discuss my own lived experiences, whether they aligned with the participants or not, to account and reflect on bias that is inherently introduced through the course of conducting interpretative research.

Principle	Klein and Myers Description
The Fundamental Principle of	This principle suggests that all human understanding

the Hermeneutic Circle	is achieved by iterating between considering the interdependent meaning of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.
The Principle of Contextualization	Requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged.
The Principle of Interaction Between the Researchers and the Subjects	Requires critical reflection on how the research data were socially constructed through the interaction between the researchers and participants.
The Principle of Multiple Interpretations	Requires sensitivity to possible differences in interpretations among the participants as are typically expressed in multiple narratives or stories of the same sequence of events under study. Similar to multiple witness accounts even if all tell it as they saw it.
The Principle of Suspicion	Requires sensitivity to possible biases and systematic distortions in the narratives collected.

Table 7-1. Evaluative Criteria of Interpretative Research (Klein and Myers, 1999)

Chapter Summary

The purpose of this research was to understand the factors that influence Black male continued participation in IT at the individual, societal and environmental level. The discussion presented throughout this chapter emphasized the key findings of the research. It was that stereotype threat, significant others, race and exposure to IT influence their decision to remain in IT. It was found that these factors work together and often are not independent of one another. It is suggested that in order to positively encourage Black male participation in IT we must take into consideration a variety of characteristics that influence that participation rather than trying to pinpoint gaps at a singular level. The research supports the Individual Differences Theory of Gender and IT and dispels generalizations about Black males being unable to go into the IT field.

Chapter 8 - Conclusion

This dissertation has provided empirical information to support that undergraduate Black males in IT are unique individuals who experience personal and institutional barriers to degree attainment that influence participation. This study documented how a group of individuals, sharing like ethnicities, from different backgrounds, in different settings perceived their own ability to overcome obstacles to IT degree attainment. This chapter presents a summary of the dissertation research. The chapter begins by presenting contributions of the research, followed by the limitations experienced and next the areas of future research. The recommendations section describes how the findings from this study can be utilized in the areas of practice and research. The limitations section provides an overview of the constraints that were realized in the study. Finally, the future research section provides an explanation of additional areas to be considered for extension of the research program.

Contributions of the Research

These results highlight Black male individual, societal and institutional characteristics on the road to IT degree attainment. Many of these men experience similar influences such as identity affiliation with the field, challenging stereotypes, the role of family, the role of advising and finding the necessary resources to be successful. However, the overarching theme is that these men did succeed in overcoming those obstacles to obtain their IT degree. While there are several factors that influence degree attainment, knowing which are particular to Black men can lead us to understanding their individual needs and assist with recruitment and retention efforts. There is evidence that supports the need for increased diversity in IT. Top Silicon Valley

companies, Fortune 500 Companies and research show that a diverse workforce is needed to develop innovative solutions.

As researchers there's a need to cultivate the minority population and assist with the removal or successful navigation of obstacles. These results indicate a small piece of that successful navigation. These results indicate that people will have individual routes to their success but after studying several you can begin to see common themes manifest themselves into successful traits such as an unwillingness to follow stereotypes, leadership skills and determination. One can also begin to identify areas for future research, interventions and policy making.

There are many contributions to the research community that this research project has provided. The contribution to theory has been substantiated through support of the Individual Differences Theory of Gender and IT by providing an explanatory power to the many groups that encompass Black males. There was evidence that showed differences with the men who were fathers as their primary rationale for entering IT is to support their current family. There were differences between the men who attended an HBCU and PWI in their experiences and how they responded to their academic environments. These men shared varying upbringings, some of which in a single parent household and others in a dual parent household. There were some who lost a parent at an early age due to life circumstances such as prison and death. This within-gender variation across these Black men who are striving for the same goal of finishing their IT degree is the strength of the Individual Differences Theory of Gender and IT. The theory provided a means by which to develop research design and analyze the data collected. The theory allowed for me to study Black men on an individual and group level of analysis while reflecting on my own past.

Furthermore, with the assistance of previous pilot studies, the larger study was successful with the use of structured interviews. Another contribution was the adaptation of the interview guide, which was successfully used to analyze the underrepresentation of women in IT, was adjusted after conducting pilot studies to be a successful instrument used to understand the underrepresentation of Black males. However, this research has shown structured interviews to be effective as a methodology for data collection. The findings in this study provide evidence that Black males pursuing careers in IT face identity, societal and environmental barriers that impact IT degree pursuit. While they face barriers they show a tremendous amount of resilience in the sense that they understand that IT is a field that will continue to grow and their desire to be part of that growth was noted in this study. This finding provides guidance for those looking to relate to Black males in IT.

This research has contributed to the growing body of knowledge about underrepresented groups in IT. The themes of Race, Age, Family, IT Identity, Personality, Exposure to IT, Stereotypes, Stereotype Threat, Significant Others, Type of Institution, Preparation for the IT Field and the Role of Advising that emerged from this study are a contribution. This project adds to the growing body of knowledge about not only race and gender but also how they manifest themselves in the computer, information science and engineering fields. This field has been one of particular interest in terms of being a high priority of national interest in regards to diversification. This project has provided insight into not only obstacles that Black males face but also means by which they overcome those barriers. Better understanding was facilitated through discussing the factors that influence participation. Knowledge was developed about how to interact with this participant group in a meaningful way for Black males. This information is critical to the efforts of diversifying the IT field.

Finally, this research contributed to practice through identifying ways in which to retain and recruit Black males into IT. Better understanding of the dynamics of advising can better help to retain Black males. Having a diverse faculty where underrepresented groups identify with them can be crucial to attracting diverse groups. Understanding that some Black males are sensitive to stereotypes and attention should be paid to how to cultivate a welcoming environment for all racial and ethnic backgrounds to feel comfortable. Providing a place for community among underrepresented students who can be viewed, as a safe haven would be beneficial to adjusting to life as an IT major. Understanding the value of resources such as diversity of courses, resources, job placement and internships can be instrumental to the long-term success of Black males in IT.

Limitations of the Research

There are three research limitations that are of note. First, this research was conducted at two institutions. In the future this research would need to be expanded across multiple universities to gain a more holistic viewpoint of Black males. Secondly, the types of schools that were included in this study should be considered. Since one was large and one was smaller there were some differences between the two. There could be differences that were present in this study that may not be if the universities were more closely equal in size and either both situated in a rural or urban area. The final limitation is the epistemological perspective that was used. It is important to note that one of the benefits of interpretative research is also a limitation. The data in interpretative research should be analyzed and presented in a transparent way through the lens of the researcher. However, through the lens of another researcher there is a chance that, using

the same data, could find differing themes and constructs than those that were presented in this research study.

Future Research

I plan to continue this research stream into my post-graduate career. One way that I plan to continue this line of research is to conduct additional interviews at like-sized institutions. I would also conduct interviews to compare institutions that are in urban and rural areas. There is also a need to conduct interviews with Latinos who are also an underrepresented group in IT. The Latino population is of particular interest because of their population growth in the United States. It has been forecasted that Latinos will surpass Whites as the largest ethnic group in the United States by 2043. It will be vastly important for the country that the Latino population feels that IT is a field that they can succeed in.

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Appendix A

Interview Guide

Trauth, E.M. (2002). "A Field Study of Individual Differences in the Social Shaping of Gender and IT". National Science Foundation Grant #0204246.

- 1) Personal Background
 - a) Definition of "IT Work"
 - b) Age
 - c) Race/Ethnicity
 - d) Family Status
 - e) Family Background (Where raised, parents work, siblings)
- 2) IT Work/Life History
 - a) Path into IT work (First exposure to IT)
 - b) Choice of IT (made how)
- 3) IT Education: type, where, degree/major
 - a) High school (type, where, magnet)
 - b) Educational background/experiences
- 4) Significant influences on IT career (events, people, literature, family)
 - a) Mentors and role models
 - b) Experience with societal influences
 - c) Role of family, education, society, significant influences
- 5) Influence of personal characteristics & skills on IT career
 - a) Stereotypes
 - b) Sports & being competitive
 - c) Coping methods
 - d) Networks & support groups
- 6) Society, Race, Education & IT
 - a) * Is IT a domain that welcomes minorities? How, why? How do Black men navigate it?
 - b) Are Black men in IT different from other races? Are you different, in what ways, why? Does a Black man have to be different from Black stereotypes to be successful? Is there a conflict between racial/ethnic identity and IT identity?
 - c) Social influences/barriers affecting Black men and IT
 - d) What's the importance of IT in American economy?
 - e) How important is education in respect to your career goals?
 - f) * Have you participated in any internships or gained research experience? If yes, in what form? If no, why?
 - g) * How important is the presence of race/ethnicity similar to yours within your career choice?
 - h) * How do you view community service? Have you taken part in community service oriented projects? How important is giving back to the community?
 - i) * What is your understanding of graduate school? Have you thought of attending graduate school? If yes, why? If no, why?
 - j) * Is graduate school emphasized at your university? Why?

- k) * How different do you think your experience at this university (HBCU or PWI) would be from (HBCU or PWI)?
- 7) Follow-up
- a) * Would you like to participate in a follow-up interview and additional parts of the research?

(* denotes additional question added to the Interview Guide by Curtis C. Cain for the purposes of this research study

Appendix B
IRB Approval (PSU)

Date: December 12, 2013
From: Courtney A. Whetzel, Compliance Coordinator
To: Curtis Cain
Subject: Results of Review of Continuing Progress Report - Exemption (**IRB #35828**)

Approval Expiration Date: December 11, 2018

"Swimming Upstream: Multicultural Students in STEM Higher Education"

The Continuing Progress Report for your study was reviewed and approved by the Institutional Review Board (IRB). By accepting this decision, you agree to obtain prior approval from the IRB for any changes to your study. Unanticipated participant events that are encountered during the conduct of this research must be reported in a timely fashion.

If your study will extend beyond the above noted approval expiration date, the principal investigator must submit a completed Continuing Progress Report to the Office for Research Protections (ORP) to request renewed approval for this research.

On behalf of the IRB and the University, thank you for your efforts to conduct research in compliance with the federal regulations that have been established for the protection of human participants.

CAW/caw

cc: Eileen M. Trauth

Appendix C

Recruitment Script (PSU)



Swimming Upstream: Multicultural Students in STEM Higher Education

Greetings! My name is Curtis Cain and I am in the process of collecting data for my dissertation at The Pennsylvania State University (Penn State) and the College of Information Sciences and Technology Office of Multicultural Affairs. With the assistance of my chair, Dr. Eileen M. Trauth and director of Multicultural Affairs, Dr. Barbara Farmer I am researching the climate of IST and how IST can improve its impact on multicultural students.

At this stage of the data collection phase, I am particularly interested in recruiting and interviewing:

- Undergraduate multicultural students in Computer Science and IST
- Undergraduate multicultural students who transferred out of IST

As a research volunteer, you will be asked to share your experiences regarding the IST climate and IST preparedness for your anticipated career. The interviews will take place in the IST building and last approximately 30 minutes. The interview will be audio recorded.

You must be 18 years or older to participate. If you are not 18, please do not agree to participate. Your decision to be in this research is voluntary. Please be assured you do not have to participate unless you wish to do so. There are no special incentives for participation. Your participation would be greatly appreciated as we strive to make IST a better environment for all students

If you are interested in being a research volunteer, please respond to this email to schedule an interview.

If you have any questions throughout the process, please let me know.

Curtis Cain

The Pennsylvania State University

College of Information Sciences and Technology

PhD Candidate

caincc@psu.edu

<http://curtis-cain.net/>

Appendix D

IRB Approval (JCSU)

Johnson C. Smith University
100 Beatties Ford Road
Charlotte, NC 28216
INSTITUTIONAL REVIEW BOARD - IRB

DECISION FORM

NOTE: The decision on this form is based on University Institutional Review Board guidelines regarding the respectful, legal and responsible treatment of human subjects. It in no way should be interpreted as an endorsement or institutional support of the merits, validity or value of the proposed research.

Researcher's Name CURTIS CAIN
Research Title SWIMMING UPSTREAM: BLACK MALES IN STEM EDUCATION
Research Adviser H. Chen, PhD
[] Approved [] Disapproved [] Requires modifications as noted below
Institutional Review Board Chair (printed name) Dr. Nicola Davis Bivens
Signature [Signature] (date) 4/27/2011
Comments:

Appendix E
Recruitment Script (JCSU)

Swimming Upstream: Black Males in STEM Higher Education

Greetings! My name is Curtis Cain and I am in the process of collecting data for my doctoral degree at The Pennsylvania State University (Penn State). With the assistance of Dr. Hang Chen; I am studying the ways Historically Black Colleges and Universities (HBCUs) and Predominately White Institutions (PWIs) prepare Black men to complete bachelors degrees in technology and engineering.

At this stage of my data collection phase, I am particularly recruiting:

- Undergraduate Black men, who are in their sophomore, junior or senior year and are pursuing degrees in IT or Engineering.

This research may have important implications for HBCUs, HBCU alumni, workplace settings, predominantly white graduate programs, and the higher education research community. This research has multiple parts and you may be asked to participate in later stages of this project as a follow-up to the initial interview.

Participation is voluntary and your responses will be kept confidential. Those who meet the criteria will be invited/asked to participate in interviews. If you have any questions throughout the process, please let me know.

Curtis Cain

The Pennsylvania State University

College of Information Sciences and Technology

PhD Student

caincc@psu.edu

cyc5261@ist.psu.edu

CURRICULUM VITAE FOR CURTIS C. CAIN

EDUCATION

- Ph.D. in Information Sciences and Technology** May 2016
College of Information Sciences and Technology
The Pennsylvania State University, University Park, Pennsylvania
- M.S. in Computer Science and Software Engineering** August 2010
Samuel Ginn College of Engineering
Department of Computer Science and Software Engineering
Auburn University, Auburn, AL
- B.S. in Information Systems Engineering** May 2008
Magna Cum Laude
School of Computer Science and Engineering
Johnson C. Smith University, Charlotte, NC

FUNDING

- National Science Foundation – Graduate Research Fellowship Program
Grant No. DGE1255832
Swimming Upstream: Black Males in STEM Higher Education (2011-2014)
- The Pennsylvania State University Africana Research Center (2011-2013)

SELECTED PUBLICATIONS

Refereed Journal Articles

- Trauth, E.M., Cain, C.C., Joshi, K.D., Kvasny, L. and Booth, K. (Forthcoming). "The Influence of Gender-Ethnic Intersectionality on Gender Stereotypes about IT Skills and Knowledge," *The DATA BASE for Advances in Information Systems*

Refereed Conference Papers and Presentations

- Cain, C.C., Trauth, E.M. (2016). "Black Lives Matter: The Journey of a Black IT Scholar," *Proceedings of the ACM SIGMIS Computers and People Research Conference* (Washington, D.C.).
- Cain, C.C., Trauth, E.M. (2015). "Theorizing the Underrepresentation of Black Males in Information Technology (IT)," *Proceedings of the 21th Americas Conference on Information Systems* (Puerto Rico).
- Cain, C.C., Trauth, E.M. (2013). "The Underrepresentation of Black Males in IT Higher Education: a Conceptual Framework for Understanding Individual Differences," *Proceedings of the 19th Americas Conference on Information Systems* (Chicago, IL).
- Cain, C.C., Trauth, E.M. (2013). "Stereotype Threat: The Case of Black Males in the IT Profession," *Proceedings of the ACM SIGMIS Computers and People Research Conference* (Cincinnati, OH).
- Cain, C.C., Trauth, E.M. (2012) "Black Males in IT Higher Education in The USA: The Digital Divide in the Academic Pipeline Re-visited," *Proceedings of the 18th Americas Conference on Information Systems* (Seattle, WA).
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- Trauth, E.M., Cain, C.C., Joshi, K.D., Kvasny, L. and Booth, K. (2012) "Understanding Underrepresentation in IT through Intersectionality," *Proceedings of the 2012 iConference* (Toronto, CA).