Exploring the Differences among IT Majors and Non-Majors: Modeling the Effects of Gender Role Congruity, Individual Identity, and IT Self-Efficacy on IT Career Choices

Completed Research Paper

K. D. Joshi
Washington State University
Pullman, Washington, USA 99164
Joshi@wsu.edu

Eileen Trauth
Pennsylvania State University
University Park, PA, USA 16802
etrauth@ist.psu.edu

Lynette Kvasny
Pennsylvania State University
University Park, PA, USA 16802
lkvasny@ist.psu.edu

Sterling McPherson
Washington State University
Spokane, Washington, USA 99210
smcpherson05@wsu.edu

Abstract

The Millennials are capable of undertaking IT majors to acquire the skills needed for success in the IT profession, yet relatively few choose to do so. How might we begin to explain the similarities and differences between the decision-making of those who choose to pursue IT-majors and those who do not? In this study, we use individual-identity and self-efficacy along with gender role theory to understand undergraduate students’ IT career decision making. By exploring both societal and individual factors, we find a middle ground that avoids the dual problems of social determinism and of seeing college students as completely free-agents. By doing so, we are able to compare how these societal and individual factors shape career intentions for both majors/non-majors. The theoretical implication of this study lies in its transformative potential with respect to theorizing the problem of underrepresentation of women and certain groups of men in field of IT.

Keywords: Career Choices, Gender Roles, Individual Identities, IT Careers, IT Self-Efficacy, IT Skills.
Introduction

Today’s traditional undergraduate students have been labeled the Net Generation, Millennials, Generation Y, and Digital Natives because of their heavy and sustained use of information technology (IT). They’ve grown up with Wikipedia, Google, and iPods. Throughout their lives, they have communicated using instant messaging and text messaging, played video games, downloaded digital music, and connected with friends and family via social networking sites (Oblinger and Oblinger, 2005). IT is simply part of their everyday lives. Many of these students who have been a potential for undertaking IT majors to acquire the skills, competencies and credentials needed for success in the IT profession, yet relatively few choose to do so.

How might we begin to explain the similarities and differences between the decision making of those who choose to pursue IT majors and those who do not? The congruence between gender roles and gender stereotyping of an occupation is often posited as a societal factor that shapes career decision making (Kidder, 2001; Eagly and Karau, 2002; Joshi and Kuhn, 2005). Gender roles are central to how we think and make judgments about ourselves, and our assessments of others’ behaviors. To the extent that influential institutional members - such as parents, educators and the media - reinforce traditional gender assumptions about the roles, aptitudes, and career options for men and women, subsequent behaviors prescribed by different roles that an individual has to perform may be experienced as incongruent or in conflict with one’s perceived gender role (Krone, Jablin, and Putnam, 1987). Gender congruity suggests, for instance, that women would be less inclined to pursue IT careers because the IT field is constructed as a male domain (Wajcman 1991; Margolis and Fisher, 2002).

While useful, Gender Role Congruency Theory alone is a partial explanation. Some women, for instance, overcome gender stereotypic constraints and pursue careers in IT. Similarly, we must go beyond gender to explain the underrepresentation of African-, Hispanic- and Native-Americans in the IT field. Researchers found there are several career related implications for underrepresented groups based on their racial and ethnic identity attitudes (Carter and Cook, 1992; Helms and Piper 1994). For instance, under-represented racial/ethnic groups may be discouraged from entering the IT field because people of their own racial/ethnic group are largely absent from the faculty teaching courses in the major and underrepresented in the technical and managerial ranks in the IT workplace.

Individual Differences Theory of Gender and IT (Trauth, Quesenbery and Morgan (2004) offers guidance for thinking about how individual variation in response to societal-level influences of racial, ethnic and gender stereotypes may be explained. This theory includes both endogenous and exogenous factors that influence an individual’s personal development and subsequent IT career decisions. Two endogenous factors, individual identity and self-efficacy, are examined in this study. Individual identity is a measure of how strongly an individual identifies with her racial/ethnic, socio-economic, and gender group. Self-efficacy is defined by Bandura (1995, p.2) as “the belief in one’s capabilities to organize and execute the courses of action required to manage prospective situations.” It is a person’s belief in her ability to succeed in a particular situation, and these beliefs determine how she will think, behave, and feel.

In this study, we use individual identity and self-efficacy along with gender role theory to understand undergraduate students’ IT career decision making. By exploring both societal and individual factors, this approach seeks to find a middle ground that avoids the dual problems of social determinism and of seeing college students as completely free agents. Moreover, we examine these intersecting factors for both IT majors and non-majors. By doing so, we are able to observe similarities and differences in how these societal and individual factors shape career intentions for both non-majors and majors.

Theoretical Framework

This research builds upon two theoretical pillars. One is the body of gender role theories which considers individual behavior in light of gender-group level influences. The other theoretical pillar is the Individual Differences Theory of Gender and IT, a gender theory anchored in the information systems field that considers a variety of influences that result in within-group variation in participation in the IT field. Taken together, they produce a complementary theoretical approach to the construction of gender in IT that can help to explain factors that enhance and inhibit males’ and females’ interest in the information
technology field. The IT scholars have used other theoretical lenses such as Theory of Reasoned Action (Joshi and Kuhn, 2011; Zhang 2007) and Social Cognitive Career Theory (Akbulut and Looney 2007; Looney and Akbulut 2007) to predict IT career choices. Given our thesis that gender, although an integral construct, does not alone explain IT career choices, we integrate both the gender theories that capture between gender differences and the Individual Differences Theory of Gender and IT which captures within gender-differences to construct a theoretical model to uncover the factors that facilitate and impede participation in IT fields.

**Gender and IT Role Incongruity**

Gender role theorists assert that gender roles are central to how we think and make judgments about ourselves and our assessments of others’ behaviors (Eagly and Karau, 2002; Kidder and Parks, 2001; Eagly, Wood and Diekman, 2000). Accordingly, gender roles are consensual beliefs about the attributes of women and men. “These beliefs are more than beliefs about the attribution of women and men. Many of these expectations are normative in the sense that they describe qualities or behavioral tendencies believed to be desirable for each sex” (Eagly and Karau, 2002, pg. 13). Research on sex-role spillover has demonstrated that gender-based expectations of behaviors can spill over into other roles that male and females engage in, regardless of the actual job role (Eagly, Karau and Makhijani, 1995). The research on spill-over effect shows that gender role expectancies can generate conflicts in the minds of individuals.

Gender roles conflicts (characterized as gender role incongruity –GRC- in our study) can arise from the perceived association between the characteristics of gender and the requirements of the social roles that sex group members occupy or aspire to occupy (such as IT professional, leader, fighter-pilot). A potential for conflict or incongruity exists when an individual holds a stereotype about gender that is incongruent with the attributes that are thought to be required for success in certain roles. Thus, a woman’s ambivalence about pursuing an IT career could arise from the incongruity that she perceives between the characteristics ascribed to females and the requirements of IT work (Camp, 1997, 1998; Katz, Allbritton, Aronis, Wilson and Soffa, 2006; Ahuja, Chudova, Kacmar, McKnight and George, 2007). For instance, roles ascribed to IT careers may be perceived by women as incongruent or in conflict with their perceived gender role (e.g., pretty cheerleader vs. a geeky programmer, skilled at math vs. verbally skilled). According to this line of thinking, a person accepts a pattern of behaviors (or roles) by resolving or reducing the emotional and cognitive dissonance caused by role conflict. Hence, from a role congruity perspectives, men and women are motivated to choose careers that are in congruity with their gender roles (Eagly, Wood and Diekman, 2000; Eagly and Karau, 2002).

Eagly and Karau (2002) proposed a Role Congruity Theory to explain negative stereotypes against female leaders. This theory builds upon the social psychology literature of stereotyping and upon the industrial-organizational psychology literature about perceptions of managerial roles. Role Congruity Theory is based on social role theory’s treatment of the content of gender roles and their importance in promoting sex differences in behavior (Eagly, Wood and Diekman, 2000). However, role congruity theory reaches beyond general gender role theory (such as social role theory) to consider the congruity between gender roles and other roles (such as leadership roles). They argued that the potential for prejudice against female leaders that is inherent in the female gender role follows from its departure from the expectations that people typically have about leaders. The Role Congruity Theory predicts that achieving leadership would be more difficult for women than men, because of a perception that women have less leadership ability and because of a preference that women not exhibit this ability and, instead, engage in what is considered to be more ‘feminine’ behavior. When applied to the examination of under-representation of women in IT, Role Congruity Theory suggests that the underrepresentation of females in certain male dominated roles can be explained partially through the perceived incongruity of IT roles with the stereotypic gender roles.

It is well documented that the IT field is a male dominated occupation (e.g. Margolis and Fisher, 2002; Joshi and Schmidt, 2006; Joshi and Kuhn, 2005; National Science Foundation, 2002; Eccles-Parsons, 1985). As such, predominately masculine attributes have been ascribed to the generic IT roles (Joshi and Kuhn, 2005; Joshi and Schmidt, 2006; Woszczynski, Myers, and Beise, 2004). Consequently, IT careers for women can be viewed as violating perceived norms of the female gender role. The Role Congruity Theory suggests that the greater the degree of masculinity present in the characterization of IT roles, the greater the incongruity between the female gender and IT roles. Conversely, if the IT roles are
perceived to be less masculine, they would be more congruent with the female gender role, and therefore the tendency to view women as less qualified than men should weaken. Defining IT roles as predominantly masculine contributes to incongruity between the female gender role and IT professional roles. Thus, a female occupying an IT role would face expectations based on her gender which may be in conflict with expectations regarding IT roles.

The Role Congruity Theory further suggests that congruity between gender and IT roles would vary based on a respondent’s sex (a male-female binary is assumed). If one assumes that, on average, men possess greater masculine traits and women more feminine traits, then it follows that there would be greater gender and IT role incongruity among the female respondents than male respondents. Hence, it is argued that this role incongruity would decrease women’s IT career intentions. This pressure to conform to the normative gender expectations is explained by gender theorists through expectancy confirmation processes. Gender role theorists posit that “through self-regulatory and expectancy confirmation processes, gender roles can induce sex differences in behavior in the absence of any intrinsic, inborn psychological differences between women and men” (Eagly and Karau, 2002, p. 510). Psychological gender literature suggests that expectancies associated with gender roles and pressure to comply to those expectancies in order to abate role incongruities promote behaviors consistent with these roles through expectancy confirmation processes (Eagly, Wood and Diekman, 2000). Research shows that gender role stereotypic expectancies are powerful and these expectancies have resulted in some of the clearest demonstrations of behavioral confirmation (e.g., Skrypnuk and Snyder, 1982; see the review by Geis, 1993). Moreover, the power of gender roles to impact behavior has also been examined and illustrated in studies of stereotype threat (Steele, 1997), which show that women’s math performance is negatively impacted by anxiety about conforming to people’s expectations that they have inferior ability (Spencer, Steele, and Quinn, 1999). Expectancy confirmation processes would suggest that female students may be less attracted to IT roles and thus less likely to aspire to IT careers if their degree of incongruity between IT and gender roles is high (Varma and LaFever 2007; Varma, Prasad and Kapur, 2006). However, the fact that there are some women in the IT field suggests that some women can tolerate a high level of incongruity, that gender and IT roles are not widely incongruent (Cohoon, 2001), or that some other factors are also in play.

Also relevant to the effects of gender roles on IT career aspirations are self-regulatory processes. Prior gender research suggests that self-regulatory processes are important causes of sex-differentiated behavior and, in turn, could explain the tendencies for certain occupations (such as IT) to remain relatively segregated by sex along gender-stereotypic lines (Eagly, Wood and Diekman, 2000; Cejka and Eagly, 1999). The notion of self-regulatory process is grounded in the concept of self-definition. Prior gender research shows that a person’s self-concept tends to include gender-stereotypic content, which implies that gender roles influence a person’s identity. This influence is even more powerful or activated by certain situations. This line of thinking would suggest that a lower proportion of women in a group would trigger self-regulatory processes consistent with gender stereotypes. Some gender research informed by this theory shows that women’s social identities in their work environments exhibit prevailing gender stereotyping, especially when women are underrepresented in the organizations at senior levels (Gilbert 2006). This line of research argues that women tend to behave gender stereotypically due to internalized aspects of gender roles, especially if situational cues (such as a lower ratio of women) make these aspects particularly accessible. This would suggest that women students, due to their underrepresentation in IT professions, would be much more likely to self-regulate and voluntarily opt out of IT careers. However, the fact that there are some women in the IT field suggests that other factors must be taken into account in order to explain how it is that not all women internalize the same gender roles or experience the same gender roles in the same ways or experience the same constraints as a result of these gender roles. The fact that some women overcome gender stereotypic constraints suggests that Role Congruency Theory is a useful, but partial, explanation because it theorizes differences based on gender, alone. That is, while Role Congruency Theory is valuable for explaining differences between the sexes with respect to participation in the IT field, it does not help to explain differences among females with respect to participation in the IT field. Thus, there is a need for theoretical insights into within-gender variation in influences that shape IT career selection and persistence.
**Individual Differences Theory of Gender and IT**

The Individual Differences Theory of Gender and IT presents an alternative to theorizing the underrepresentation of women in the IT field based upon sex-group level assumptions. The prevailing theories currently reflected in the majority of literature about the underrepresentation of women in the IT field tend to adopt either an essentialist or a social constructivist theoretical stance (for discussions of this see Trauth, 2002). Essentialism is the assertion of fixed, unified and opposed female and male natures (Wajcman, 1991 p. 9). When applied to the topic of gender and IT, the essentialist perspective presumes the existence of relevant inherent differences between women and men with respect to information technology. It uses the observed differences in the participation of women and men in the IT field as evidence of this view. Thus, the causes of gender under representation in IT are attributed to inherent differences between men and women that are presumed to derive from bio-psychological differences between the sexes. The social construction theoretical perspective focuses on IT as a male domain. Reflective of gender role congruency theory at the psychological level, this theoretical perspective, which operates at the sociological level, asserts that society has constructed a fundamental incompatibility between feminine identity and the gender identity of information technology and IT work as masculine.

This theory emerged in response to a perceived need for greater theorization of the role of within-gender variation in explaining the underrepresentation of women in the IT field. Developed by Trauth in prior research (field studies of women IT professionals), it focuses on understanding the individual variation in response to societal-level gender influences regarding IT (Morgan, Quesenberry and Trauth, 2004; Quesenberry and Trauth, 2005, 2012; Quesenberry, Trauth and Morgan, 2006; Trauth 2002, 2006; Trauth and Howcroft, 2006; Trauth and Quesenberry 2005, 2006, 2007; Trauth, Quesenberry and Morgan, 2004; Trauth, Quesenberry and Yeo, 2008; Trauth, Huang, Morgan, Quesenberry and Yeo, 2006; Trauth, Quesenberry and Huang, 2008, 2009; Karahanna, Ahuja, Srite and Galvin, 2002). It is concerned with addressing the question of why some women enter and persist in the IT field in the face of systemic gender biases and gender role incongruity that manifest themselves in both education and the workplace. The theory posits that the answer can be found in the combined influence of endogenous and exogenous factors that influence an individual’s personal development and subsequent IT career decisions. That is, while all females in a particular society may be exposed to the same messages about gender roles and IT careers, both the interpretation of these messages and the response to them will vary as a result of individual factors (Trauth and Quesenberry, 2006). Thus, the Individual Differences Theory of Gender and IT searches for the causes of gender under representation by examining the factors that account for the varied ways that individuals internalize and respond to gendered messages. It seeks to understand the sources of individual agency that enable some women to overcome systemic negative influences.

According to this theory an understanding of individual responses to societal influences can be obtained from an understanding of the combination of personal characteristics and environmental influences. Hence, the focus is on differences within rather than between genders. The theory also views women and men as individuals who possess different technical talents and inclinations and respond to the social shaping of gender in unique and particular ways. This theory acknowledges that common social shaping messages are conveyed to subgroups in a culture (e.g. to women by age, race, etc.). But at the same time it also takes into account the varied influence of individual background and critical life events that result in a range of responses to those uniform messages (i.e. not all women of a certain age group respond in the same way to commonly received messages).

The Individual Differences Theory of Gender and IT is comprised of three general constructs that, together, explain women’s decisions to enter and remain in the IT field. The individual identity construct includes both personal demographic items (e.g. age, race, ethnicity, nationality, socio-economic class, and parenting status) and career items (e.g. industry in which one currently or will work, IT discipline – computer science, information systems and information science – one is studying). The individual influence construct includes personal characteristics (e.g. educational background, personality traits and abilities) and personal influences (e.g. mentors, role models, experiences with computing, and other significant life experiences). Finally, the environmental influence construct includes cultural attitudes and values (e.g. attitudes about IT, about women in IT, about race/ethnicity) related to the geographic area in which one lives, as well as economic and policy influences in that region/country. The Individual Differences Theory of Gender and IT posits that, collectively, these constructs account for the differences among men and women in the ways they relate to the IT field, and societal messages about women and
Research to date, has investigated a number of dimensions of variation among women. Quesenberry and Trauth (2007, 2008, 2012) explored variation in career anchors among women IT professionals. Morgan, Quesenberry and Trauth (2004) developed a framework of the varied responses of women to male dominated social networks in the IT workplace. Regional and national cultural and economic factors that help to explain the variation in women’s participation in the IT workforce were considered in a set of papers (Trauth, Quesenberry and Huang, 2008; Trauth, Quesenberry and Yeo, 2008). In another set of papers (Trauth and Howcroft, 2006; Howcroft and Trauth, 2008) a critical lens was applied to interpret the experience of and reaction to gender role expectations and biases. Finally, a set of papers employ this theory to examine the issue of work and family. Trauth and Quesenberry (2005) examined the ways in which women employ ubiquitous computing technology in order to achieve work-life balance. Quesenberry, Trauth and Morgan (2006) investigated the different ways in which women accommodated motherhood and their IT careers. Finally, Ridley and Young (2012) employed this theory in a critical analysis of societally-imposed gender roles reflected in Australian newspaper articles about women and IT.

The research reported in this paper includes two of the constructs of the Individual Differences Theory of Gender and IT—individual identity and individual influences -- along with gender role theory in order to understand underrepresented groups in IT. It is accomplished by building on prior research that focused on differences with respect to race, ethnicity and class (Kvasny, Trauth and Morgan, 2009). This theory enables the exploration of complex interactions among specific aspects of the individual identity construct (i.e., race, gender, class and ethnicity) in order to provide more nuanced ways of understanding their relationship to career interests of young women and men (Augustine, Camp, Martin and Wardle, 1999). For instance, it has been shown that ethnic identity and other-group orientation are more significant predictors of career decision-making self-efficacy for people of color than for whites. Women of color "may have the skills and abilities to successfully compete and make decisions regarding the world of work but may not believe that they will be allowed or accepted in the workforce" (Gloria and Hird, 1999 p. 168). In addition to gendered glass ceilings, women of color may also perceive challenges based on racism and discrimination. Thus, the external environment that women of color perceive is in some ways similar to but also quite different from the environment perceived by white women.

In addition, the individual influence construct of this theory facilitates examination of the relationships among race, ethnicity and class, on the one hand, and personal self-efficacy on the other. Prior studies on the interaction of race and gender in STEM education suggest that gender differentiated self-confidence in STEM learning varies across race. For instance, African-American women were found to be independent and assertive and, in some cases, expressed greater confidence than women in other racial/ethnic groups with regard to STEM education and education in general. However, African-American women who choose majors in STEM tend to be from high schools where they have been seen as academically outstanding relative to their peers. These highly capable women have developed strong academic self-confidence but have not taken or been offered the advanced placement or similar coursework necessary for STEM programs at the college level—especially in highly selective universities (Lopez and Schulte 2002a; Lopez and Schulte 2002b). These women face a unique dilemma which Seymour and Hewitt (1997) term the “conflict between over-confidence and poor preparation”.

Taken together, the individual identity and individual influences constructs of this theory combined with gender role congruency theory provides a more robust examination of influences on the individual’s career intentions. That is, as a person perceives few barriers and believes in her or his ability to undertake an endeavor, she will persist in STEM coursework and have a higher likelihood of being successful (Camp 1997, 1998; Stockard, Myungsook and Akbari, 2005). And this likelihood of success reinforces the career intention. However if the barriers are viewed as significant and self-efficacy is low, there is a weaker intention. For under-represented groups, self-efficacy beliefs may be undermined by a combination of racial and sex-role stereotypes. Indeed, a review of studies of self-efficacy in IT and STEM across countries, decades and educational environments reveals a consistent finding: observed gender differences in self-efficacy can be directly linked to the imposition of gender role stereotypes and stereotype threat (Guimond and Roussel, 2001; Hamlin, Riehl, Hamlin and Monte, 2010; Henwood, 2000; Kwan, Trauth and Driehaus, 1985; Serva, Baroudi and Kydd, 2009).

Therefore, individuals may foreclose career options that they perceive are not truly open to them.
This type of finding would be highly troublesome because it would suggest that women may, in fact, be discouraged from majoring in STEM-related disciplines. This type of finding would also be helpful in that it clearly demonstrates the fact that some women have been able to persist and achieve in a non-supportive environment. Use of the theoretical lens of the Individual Differences Theory of Gender and IT enables drawing insights into coping mechanisms and self-efficacy as ways of theorizing women’s persistence in non-supportive environments.

**Conceptual Model and Research Question**

Based on these theoretical underpinnings, we argue that individual identities and IT self-efficacy intersect with gender role congruity to explain IT career intentions. We further posit that individual identities and IT self-efficacy moderates the relationships between gender role congruity and IT career intentions. The gender is modeled and handled in this study very subtly (not simply as male or female) first by computing gender role congruities based on one's sex and gender typing of IT skills and then by capturing an individual’s gender identities. In our research model, the IT roles construct is conceptualized as an individual’s personal views about the important attributes, skills and competencies required for IT work, while the gender roles construct is conceptualized as an individual’s internalization of socially defined gendering of attributes necessary to be an IT professional. These attributes are described along a masculine /feminine continuum. These two constructs are used to measure gender role congruency, which is the congruency between gender roles and IT stereotypes. The individual identity construct is conceptualized as relative importance or salience of sex, ethnicity and class in shaping a sense of identity. The individual self-efficacy construct is conceptualized as the individual’s belief that he or she can complete tasks necessary to becoming an IT professional. Finally, career intention is operationalized as an individual’s intentions regarding their future IT careers. The resulting research model is shown in Figure 1.

The objective of this study is to explore the intersecting influences of three factors -- individual identity (derived from ethnicity and socio-economic class), self-efficacy, and gender role congruency – on IT career intentions of university students who are considering IT or have already committed to an IT career. The overarching research question examined in this study is the following:

**Do IT majors and non-majors who receive similar gender-stereotypic messages regarding role expectations display different behavioral intentions with respect to choosing an IT career when self-efficacy and individual identity are taken into account?**

![Figure 1. Research Model](image)
Methods

Data Collection

A survey methodology was used to examine the posited research question. Undergraduate students enrolled in IT courses at eleven large U.S. universities were surveyed to model the effects of gender role congruity (GRC), IT self-efficacy (SE) and individuals’ identity on IT career choices to explore the differences among IT majors and Non-IT majors. Students participated in this study on a volunteer basis with the opportunity to earn bonus points. A total of 5,585 students completed the survey. The sample is comprised of 62% of males, 38% of females. Of those who identified the academic major status, 66% of the students in the sample report to have selected a non-IT-related major, 34% report to have chosen an IT related major. In our model we controlled for university attended. We do not need to control for gender, class, and ethnicity because these identities are captured through the individual identity constructs.

Operationalization of Constructs

The scales for IT Career Intentions (CI) (Taylor and Todd 1995), Gender Identity (GI) (Bem Sex Role Inventory (BSRI) ; Bem, 1981), Ethnic Identity (EI) (Ethnic Identity Measure (MEIM) ; Phinney, 1992), Class Identity (ClsD) (Status Identity Scale, Thompson and Subich, 2007) were adopted from the existing literature. However, the items for IT SE and Gender Role Congruity (computed using IT Skills Importance and IT Skills gender typing) constructs were based on an extensive review of extant literature conducted by Huang et al. (2009) who reviewed IT job skills across three genres of texts: scholarly articles, practitioner literature, and online job ads. The content from these three sources were analyzed using a two stage, grounded theory approach in which the IT job skills emerged from the data. In the first stage, three coding schemes were developed based on the articles and job advertisements. In the second stage, the authors synthesized and summarized the data across the three data sources to develop a comprehensive set of 60 skill items. In this study we further consolidated these 60 items into 39 broader categories (e.g., C#, COBOL, Java, .NET were consolidated into one item, namely Programming Skills). These 39 items were used to measure IT Self-Efficacy and IT Skills Importance and IT Skills Gender Typing constructs. The psychometric properties of IT Self-efficacy and Career Intentions measurement scales were reported in the earlier publications (Joshi et al. 2010). However, the psychometric properties for each of the remaining constructs are briefly discussed below.

Measures

The measurement model with the validated factor structures for each of the constructs included in our research model is illustrated in Figure 2. An extensive multi-year pilot study was conducted to uncover this measurement model and to test the psychometric properties of the constructs included in this model. The focus of this study is to test the structural model and thus the measurement model is describe only briefly in this manuscript. More details about the measurement structures and the corresponding statistics and the survey items used to measure the constructs can be obtained directly from the authors.

IT Self-efficacy

The individual identities account for variation within gender groupings by examining the ways in which gender, ethnicity and social class influence career intentions as postulated by Trauth’s Individual Differences Theory of Gender and IT. IT self-efficacy was measures using the 39 skills identified from the literature (see “Operationalization of Constructs” section for more details). On the scale of 1 (not at all confident) to 5 (totally confident), respondents were asked to specify their level of self-confidence about their ability to learn and engage with each of the 39 skills items. To avoid any bias due to sequencing, these 39 items were presented to each individual in a randomized fashion. First, an exploratory factor analysis was conducted on 39 IT skills to uncover the factor structure underlying the IT self-efficacy construct. The items which did not load cleanly load on any of the factors were removed before conducting confirmatory factor analysis. Two factors emerged from this analysis. One of the factors, labeled as
Technical Self-efficacy (TSE), comprises of technical centric skills such as, programming skills, IT security skills; whereas, the other factor, labeled as Non-Technical Self-Efficacy (NTSE) captures all the non-technical skills such as leadership skills, customer relationship skills (Joshi et al. 2010).

**Figure 2. Measurement Model**

**Gender Role Congruity**

GRC measures the degree to which an individual's perceptions regarding the importance of IT roles are congruent with his/her gender and gender typing of those roles. This measure accounts for the variation between gender thus explaining gender-group level influences postulated by Gender role theorists such as Eagly. In order to compute this measure, the participants’ perceptions about IT roles and gender typing of those roles were captured using the 39 skills discussed above (see “Operationalization of Constructs” section for more details). The IT roles captured participants’ perceptions regarding the importance of the 39 skills necessary to successfully perform the roles prescribed to IT professionals. Their perceptions were captured on the scale of 1 (not at all important) to 5 (very important), respondents were asked to specify, for each of the 39 skills, their opinion about how important is it that someone working in an Information Technology career would need these skills to be successful. Whereas, the gender typing of these same roles captures their perceptions regarding the degree to which these 39 skills are gendered. For this construct, using the same list of 39 skills individuals were asked to specify on a Likert scale (with ‘feminine’ and ‘masculine’ as anchors) the degree to which they consider a skill to be masculine or feminine. For females the anchor represented an increasing degree of femininity (1 masculine; 5 feminine) whereas for males the anchor represented an increasing degree of masculinity (1 feminine; 5 masculine). The Gender Role Congruity (GRC) measure was computed by subtracting an individual’s rating on the importance scale with the gender typing scale (Joshi and Kuhn, 2011). We GRC values were converted to z-scores in order to make the interpretation simpler (i.e., mean of 0, standard deviation of 1). This variable was coded to measure the increasing level of incongruity such that 0 indicates perfect congruity, while scores that get farther away from 0 indicate more incongruity, i.e., the higher the score, the lower the congruity level. Zero means an individual's stereotypic gender roles are completely congruous (i.e. low incongruity) with the IT roles. Reciprocally, as a person’s score moves away from zero, then his/her stereotypic gender roles are more incongruous with the IT roles (i.e., high incongruity). These GRC scores were used to conduct the EFA and CFA analysis to first uncover the factor structure underlying the GRC.
construct, and then to validate the fit of the resulting measurement structure. EFA analysis revealed a strong support for a three factor structure ($\chi^2(741): 80235.40$, $p<.001$; CFI: 0.971; RMSEA: 0.025 (C.I. 0.024-0.025); SRMR: 0.017). The CFA analysis provided strong support for our measurement model, which suggested that the gender role congruity items under each of the three factors were adequately measuring the three GRC constructs. Table 1 lists the three factors, i.e., Interpersonal Gender Role Congruity (IGRC), Analytical Gender Role Congruity (AGRC), Technical Gender Role Congruity (TGRC). The model fit statistics for the CFA are also listed in Table 1. The loading ranged from 0.25 to 0.85, which explains variance in their respective factors ranging from 6.3% to 72.3% (Due to space limits loadings are excluded, however they are available from the authors upon request).

<table>
<thead>
<tr>
<th>Table 1 Confirmatory Factor Analysis for the Gender Role Congruity Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender Role Congruity Factors</strong></td>
</tr>
<tr>
<td><strong>Interpersonal Gender Role Congruity (IGRC)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Analytical Gender Role Congruity (AGRC)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Technical Gender Role Congruity (TGRC)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Individual Identities

Like IT SE, the individual identities account for variation within gender groupings by examining the ways in which gender, ethnicity and social class influence career intentions as postulated by Trauth’s Individual Differences Theory of Gender and IT. The ethnicity identity will be measured using Multigroup Ethnic Identity Measure (MEIM; Phinney, 1992). MEIM scale which is developed to capture the race/ethnicity identity has good psychometric properties (see Pontinotto, et al., 2003). The sex role identity will be captured using Bem Sex Role Inventory (BSRI 27 items scale) (Bem, 1981). Not only does BSRI have shown to have excellent reliability and high validity, but it is also the most frequently used sex role instrument (Lenney, 1991, pg 582). We used Thompson and Subich (2007) class status scale to measure class identity. This scale has three dimensions comprising of a total of 13 items (access to resources; benefits; and feel valued as compared to average US citizen) that collectively form a latent class Identity factor. We re-validated the psychometric properties of these three scales. The factor structure in MEIM and Class identity scale remained intact. However, the BSRI scale factor structured revealed three factors instead of two factors. The non-feminine items were split into two factors. One factor which included 11 items, such as Independent, Ambitious, is similar to Bem’s Masculine gender identity (MGID). Whereas, the second factor which included 7 items, such as Dominant, Aggressive, Competitive, represents hegemonic masculinity gender identity (HMGID). The remaining 9 nine items, such as Affectionate, Sympathetic, Sensitive to other’s needs, which loaded together are collectively labeled as feminine gender identity (FGID).

<table>
<thead>
<tr>
<th>Table 2a. Descriptive Statics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IT Majors</strong></td>
</tr>
<tr>
<td><strong>Mean</strong></td>
</tr>
<tr>
<td>CI</td>
</tr>
<tr>
<td>IGRC</td>
</tr>
<tr>
<td>AGRRC</td>
</tr>
<tr>
<td>TGRC</td>
</tr>
<tr>
<td>TSE</td>
</tr>
<tr>
<td>NTSE</td>
</tr>
<tr>
<td>EID</td>
</tr>
<tr>
<td>CLASSID</td>
</tr>
<tr>
<td>FGID</td>
</tr>
<tr>
<td>MGID</td>
</tr>
<tr>
<td>HMGID</td>
</tr>
</tbody>
</table>

Analysis and Results

The descriptive statistics for all the constructs are listed in Table 2a. The posited research model represents a type of path analysis, or covariance structure model. All analyses were conducted using Mplus version 7.1 (Muthén and Muthén, 1998-2006). We utilized the robust maximum likelihood estimator, and missing values were handled using full information maximum likelihood. This type of modeling is achieved by simultaneously estimating multiple regression paths, and allows one to relax many of the assumptions associated with traditional regression techniques (i.e., homogeneity of variance, independence of exogenous predictors, etc.). However, the models presented here are saturated (i.e., all possible regression paths were included) and therefore common measures of fit are not useful because they will indicate that this model fits perfectly (e.g., CFI = 1.00). The structural model accounted for 19% variance for IT Majors and 18% variance for non-IT majors. The standardized path coefficients, its level
of significance, and the standard errors (S.E) are provided in Table 2b. Figure 3 depicts the Table 2 results visually, where the red color signifies significant negative relationships and blue color represents significant positive relationships. The light blue and light red on the non-IT major model represents significance at $p<0.06$ levels.

The main effects of all three GRC (Interpersonal, Analytical, Technical) variables have no direct significant effects on Career Intentions (CI) – this holds for both major and non-IT majors. The direct effects of technical SE have positive effects on CI for both majors and non-IT majors, whereas, none-technical SE has negative effects on CI for both major and non-IT majors. Only the hegemonic GID has negative effects on CI for majors, all other GID has no effects on CI for majors or non-IT majors. The ethnic ID has negative effects on CI for both majors and non-IT majors. The class ID has no significant effects on CI for both majors and non-IT majors. Although the main effects are interesting, we are more interested in the interaction effects because we theorized that the intersectionality of GRC with identities and IT self-efficacy better explains IT career choices.

### Table 2b. Standardized Path Coefficients

<table>
<thead>
<tr>
<th>Hypothesized Relationships</th>
<th>IT Majors - STD $\beta$ (S.E)</th>
<th>Non IT Majors - STD $\beta$ (S.E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGRC – CI</td>
<td>0.213 (0.307)</td>
<td>-0.281 (0.321)</td>
</tr>
<tr>
<td>AGRC – CI</td>
<td>-0.226 (0.386)</td>
<td>0.499 (0.377)</td>
</tr>
<tr>
<td>TGRC – CI</td>
<td>0.576 (0.372)</td>
<td>-0.256 (0.252)</td>
</tr>
<tr>
<td>TSE – CI</td>
<td>0.306 (0.38)**</td>
<td>0.0377 (0.024)**</td>
</tr>
<tr>
<td>NTSE – CI</td>
<td>-0.141 (0.042)**</td>
<td>-0.122 (0.031)**</td>
</tr>
<tr>
<td>EID – CI</td>
<td>-0.111 (0.032)**</td>
<td>0.038 (0.023)</td>
</tr>
<tr>
<td>ClsID – CI</td>
<td>0.049 (0.035)</td>
<td>-0.043 (0.022)</td>
</tr>
<tr>
<td>FGID – CI</td>
<td>0.074 (0.042)</td>
<td>-0.054 (0.035)</td>
</tr>
<tr>
<td>MGID – CI</td>
<td>0.036 (0.036)</td>
<td>0.010 (0.025)</td>
</tr>
<tr>
<td>HMGID – CI</td>
<td>-0.197 (0.037)**</td>
<td>0.010 (0.027)</td>
</tr>
<tr>
<td>IGRCxTSE – CI</td>
<td>-0.898 (0.239)**</td>
<td>0.283 (0.138)*</td>
</tr>
<tr>
<td>AGRCxTSE – CI</td>
<td>0.721 (0.196)**</td>
<td>-0.182 (0.096)</td>
</tr>
<tr>
<td>IGRCxNTSE – CI</td>
<td>0.208 (0.318)</td>
<td>-0.210 (0.269)</td>
</tr>
<tr>
<td>AGRCxNTSE – CI</td>
<td>0.363 (0.405)</td>
<td>0.59 (0.305)</td>
</tr>
<tr>
<td>TGRCxNTSE – CI</td>
<td>-1.119 (0.317)**</td>
<td>-0.120 (0.213)</td>
</tr>
<tr>
<td>IGRCxEID – CI</td>
<td>-0.042 (0.156)</td>
<td>-0.036 (0.161)</td>
</tr>
<tr>
<td>AGRCxEID – CI</td>
<td>0.387 (0.193)</td>
<td>-0.308 (0.174)</td>
</tr>
<tr>
<td>TGRCxEID – CI</td>
<td>-0.537 (0.161)**</td>
<td>0.353 (0.120)*</td>
</tr>
<tr>
<td>IGRCxFGID – CI</td>
<td>-0.240 (0.392)</td>
<td>-0.094 (0.291)</td>
</tr>
<tr>
<td>IGRCxMGID – CI</td>
<td>-0.182 (0.417)</td>
<td>0.254 (0.335)</td>
</tr>
<tr>
<td>IGRCxHMGID – CI</td>
<td>0.220 (0.316)</td>
<td>-0.462 (0.244)</td>
</tr>
<tr>
<td>AGRCxFGID – CI</td>
<td>-0.019 (0.187)</td>
<td>-0.037 (0.178)</td>
</tr>
<tr>
<td>AGRCxMGID – CI</td>
<td>0.321 (0.260)</td>
<td>0.066 (0.209)</td>
</tr>
<tr>
<td>AGRCxHMGID – CI</td>
<td>0.098 (0.203)</td>
<td>0.106 (0.158)</td>
</tr>
<tr>
<td>TGRCxFGID – CI</td>
<td>-0.459 (0.201)*</td>
<td>0.392 (0.204)*</td>
</tr>
<tr>
<td>TGRCXMGID – CI</td>
<td>0.650 (0.264)*</td>
<td>-0.533 (0.236)*</td>
</tr>
<tr>
<td>TGRCHMGID – CI</td>
<td>-0.146 (0.225)</td>
<td>0.398 (0.167)*</td>
</tr>
<tr>
<td>IGRCxClsID – CI</td>
<td>-0.110 (0.178)</td>
<td>0.376 (0.179)*</td>
</tr>
<tr>
<td>AGRCxClsID – CI</td>
<td>-0.169 (0.217)</td>
<td>-0.240 (0.204)</td>
</tr>
<tr>
<td>TGRCxClsID – CI</td>
<td>0.175 (0.202)</td>
<td>0.089 (0.142)</td>
</tr>
<tr>
<td>University (Control)</td>
<td>0.164 (0.024)**</td>
<td>0.013 (0.019)</td>
</tr>
</tbody>
</table>

* $p < 0.05$, **$p < 0.001$; ***$p < 0.000$
**Figure 3. Results**

*(Red- Negative relationship ; Blue positive relationship)*

**GRC and IT Self-Efficacy Interactions**

Overall, only technical and analytical GRC interact with SE for both IT majors and non-IT majors. The Interpersonal GRC does not interact with SE to significantly influence IT career choices. As illustrated in Table 3, for IT Majors, technical SE and analytical GRC interact to negatively affect IT career intentions. The positive association between technical SE and intentions holds only when an individual’s analytical gender role and IT roles are congruent. When these roles are incongruent, intentions to pursue IT careers for Individuals do not significantly change with the increase in technical SE. For non-IT Majors, technical SE and AGRC interact to positively affect IT career intentions. The positive association between technical SE and IT career intentions hold irrespective of AGRC. Although, decrease in analytical GRC lead to higher intentions to pursues IT careers.

**Table 3. Interaction Effects of Technical SE and Analytical GRC on Intentions to Pursue IT careers**

<table>
<thead>
<tr>
<th>Majors</th>
<th>Non Majors</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Graph showing interaction effects for IT Majors" /></td>
<td><img src="image2" alt="Graph showing interaction effects for Non Majors" /></td>
</tr>
</tbody>
</table>

---

*Thirty Fourth International Conference on Information Systems, Milan 2013*
As illustrated in Table 4, for IT Majors, technical SE and technical GRC interact to positively affect IT career intentions. The positive association between technical SE and intentions hold for all levels of TGRC. However, intentions to pursue IT careers increases with the increase in role incongruity, this is especially strong for individuals with higher technical SE. For non-IT Majors, the interaction between technical SE and TGRC affects IT career intentions negatively at 0.057 levels. Unlike for IT majors, intentions to pursue IT careers for non-IT majors increases with the increase in role congruity.

Table 4. Interaction Effects of Technical SE and Technical GRD on Intentions to Pursue IT careers

<table>
<thead>
<tr>
<th>Majors</th>
<th>Non Majors</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Technical Congruity</th>
<th>Technical Incongruity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Technical SE</td>
<td>High Technical SE</td>
</tr>
</tbody>
</table>

Table 5. Interaction Effects of Non-Technical SE and Technical GRC on Intentions to Pursue IT careers (IT Majors)

<table>
<thead>
<tr>
<th>Career Intentions</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Technical Congruity</th>
<th>Technical Incongruity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Non Tech SE</td>
<td>High Non Tech SE</td>
</tr>
</tbody>
</table>
As illustrated in Table 5, for IT Majors, non-Technical SE and technical GRC interacts to negatively impact IT career intentions. Intentions to pursue IT careers increases with the decrease in technical congruity (i.e., high technical incongruity), this association is significantly strong for individuals with low non-Tech SE. However, this interaction has no significant effects on non-IT majors’ career intentions.

**GRC and Ethnic Identity Interactions**

For IT majors, the ethnic identity interacts with analytical GRC to positively affect career intentions, but interacts with technical GRC (Illustrated in Table 6) to negatively (because greater the congruity lower the intention) affect career intentions. Whereas, this associations are reversed for non IT majors, i.e., analytical GRC interact with ethnic identity to negatively affect CI, but technical GRC interaction (shown in Table 6) with ethnicity identity are positive (because greater the congruity higher the intention).

![Table 6. Interaction Effects of Ethnic ID and Technical GRD on Intentions to Pursue IT careers](image)

**GRC and Class Identity Interactions**

For IT majors, the class identity has no significant interactions with GRC. Whereas, for non-IT majors, class identity and interpersonal GRC interacts to positively affect IT career intentions, this association is especially strong for individuals who identify with the lower class. For the individuals who identify with the lower class - it would be especially helpful if their interpersonal incongruity is mitigated.

**GRC and Gender Identity Interactions**

For IT majors, hegemonic masculine gender identity interacts with analytical GRC to positively affect CI, but its interaction with interpersonal GRC affects CI negatively. This is reversed for non-IT majors, where analytical GRC negatively affects CI, but its interaction with interpersonal GRC affects CI positively. In addition, for non-IT majors, technical GRC interacts with hegemonic masculine gender identity to positively affect CI, whereas this association is not significant for IT majors. Feminine or masculine gender identities do not interact with GRC to affect CI.
Concluding Discussion

This study posited that the gender role theories which consider individual behavior in light of gender-group level influences do not solely explain why some individuals choose to major in IT while others do not. Our aforementioned thesis that group level influences alone are not adequate at explaining IT related career choices was confirmed. All three types of GRC do not have significant direct effects on career intentions of individuals who are considering IT careers or those who are not. However, GRC’s influence (i.e., societal factor) becomes significant when they interact with individual identities and self-efficacy (i.e., individual factors). This further strengthens our thesis that assertions of social determinism perspectives coupled with the perspectives of individual agency collectively conspire to shape individuals’ IT career choices.

An interesting pattern emerges while examining the similarities and differences between those who choose to pursue IT career and those who do not. For both the groups, i.e., IT Major and non-IT majors, although the direct effects of various factors on CI are similar, the directionality of these effects reverses when interactions are introduced. For instance, the direct effects of ethnic identity on CI are negative for both the groups. However, the interaction effects of EI with GRC on CI are reverse. On the one hand, the analytical GRC interacts with EI to positively affect CI for IT majors, whereas this interaction effect is negative for non-IT majors. On the other hand, technical GRC interacts with EI to negatively affect CI for IT majors, whereas this interaction effect is negative for non-IT majors. Similar patterns are revealed for SE and gender identity factors. If we surmise that the association patterns uncovered for the IT majors are more favorable in shaping one’s intentions regarding IT career choices, then these patterns can be useful in understanding the GRC, SE and Identity scores and configurations that are more likely to amplify one’s consideration to pursue IT careers. For instance, for IT majors, high levels of technical gender role incongruity is not interfering with their intentions of pursuing IT careers which could suggest that in the presence of sufficient technical self-confidence, IT majors are able to cope with or negate the incongruities created by the technical skills required to perform IT roles. However, for these individuals who possess high levels of technical SE and are majoring in IT, their intentions are significantly higher when the analytical incongruities are attenuated. Future research should conduct qualitative studies to further unpack the meanings of these patterns observed in the IT major model test in this study to understand how non-majors profiles depicted in Figure 2 can be made to look more like the major profiles.

The negative effects of Non-technical SE (confidence in soft skills such as leadership skills, negotiations skills) on CI are not new (Joshi et al., 2010). However, the interaction effects of TGRC and NTSE on CI are new and interesting because it uncovers that this negative association does not hold if students’ IT technical roles are congruent with their gender roles. In other words, IT majors with high NTSE have higher intensions to major in IT than individual who have lower levels of NTSE only if the IT technical roles are congruent with their gender roles (see Table 5).

This study reveals some interesting interaction patterns among the GRC, SE and individual identities. In addition, it highlights that when the influences of socially constructed normative factors (such as GRC) interact with factors at the individual levels, it generates interaction effects that are complex and difficult to unpack and interpret. As a result, some of these findings need to be examined at a more nuanced level by breaking these models down at sex and race levels. For instance, in order to fully understand the role ethnic identity plays in negatively influencing CI, it is essential to model these effects separately for each race/ethnicity (e.g., Whites, African American, Hispanics etc.). This separation will allow us to answer questions such as, does EI matter for all the races? Or does it matter only for certain races? Or does it matter more for one race than the other? Do these ethnic identities interact with the stereotypic social factors to create unique gender role incongruities for each race? Furthermore, in order to comprehensively investigate whether the influences of ethnic identities or gender identities are segregated along gender lines, it would be useful to model the posited effects by race and sex. Future research needs to examine these effects to unpack the similarities and differences in how these societal and individual factors shape career intentions for both non-majors and majors.
Contributions and Future Work

The theoretical implication of this study lies in its transformative potential with respect to theorizing the problem of underrepresentation of women and certain groups of men in field of IT. It will contribute greater theorization of gender as it relates to participation in IT discipline because it goes beyond the widely accepted gender role theory to develop new and nuanced insights (e.g., uncovering factors that explain within gender differences) which are not currently available in the literature. To our knowledge this is the first information systems study which has attempted to tackle the complex intersecting identities by theorizing, positing, and validating measurement and a predictive model. With this modeling, we seek to understand the interaction of the societal and individual factors that collectively shape an individual’s IT career intentions. We believe, although in its incipient stages and further unpacking of these interactions are necessary, this is a significant first step forward in understanding the effects of the confluences of role, identities and confidence play in facilitating or impeding one’s the formation of one’s IT career intentions.

The findings also have pedagogical implications. Our model suggests that IT majors and non-IT majors are internalizing individual and societal factors differently (direct effects are similar, but interactions are in opposite direction for majors and non-majors). Therefore, understanding the relationships among the individual and broader societal and cultural factors, and the effects of these relationships on IT career choices will allow customized programs and interventions for individuals who have not yet crystallized their career choices based factors that are most salient to them. This customized approach could help individuals to develop appropriate coping skills and strategies for achieving success, to address cognitive processes that shape their interactions within the IT educational and work environments, and to think outside of our own (IT educators’) cultural frames of reference to create affirming environments that are conducive to pursuing to all IT majors. For instance, examining the nature of the intersecting influences of three factors on IT career choices for African American (AA) men could help uncover the stereotypic messages that are shaping their gender role congruity within the context of IT and how these role interact with their individual identities and IT self-efficacy. Understanding the serotypes that are constraining AA men from selecting and succeeding in IT careers would help in developing targeted recruitment and programmatic. One such example of customized approach can be found in Glitch project through Electronic Learning Communities Lab in the School of Interactive Computing at Georgia Tech (DiSalvo and Bruckman 2011). This project hires AA men as game testers to evaluate a pre-release version of NCAA Football by Electronic Arts. Games (both the video games and the game of football) are congruent with gender roles and identities of young African-American men.
Acknowledgement: This material is based in part upon work supported by the National Science Foundation under Grant Number 1232344. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.

2. References


DiSalvo, B., and Bruckman, A. (2001) From Interests to Values - Computer science is not that difficult but wanting to learn it is, Communications of the ACM, 54 (8).


National Science Foundation (NSF) *Division of Science Resource Statistics* NSF02-335, September, 2002.


