

An Exploration of Anchoring Female Millennial Students to an IT Career Path: The CLASS Model

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Abstract

There has been much research conducted on the under-representation of women in Science, Technology, and Engineering & Math (STEM). Looking specifically at the area of Information Systems and Information Technology (IS/IT), women are largely under-represented in degree programs and the workforce. With the growth in the IS/IT workforce and the future demands of IS/IT career growth, the importance of understanding the perceptions and influences on the female IS/IT students grows. While there is research investigating the demographics of the IS/IT workforce, the relationship between female students and millennial influences has not been investigated.

This research contends that addressing the demographic influences on the large generation entering the workforce will provide advantages to research and practice. Following an analysis of qualitative data, collected in a Midwestern university using surveys, this research explains the perceptions of female millennial students interacting with the IS/IT educational experience and career pursuits. The CLASS (Competencies, Life System, Accomplishments, Service & Security) model which illustrates how female students motivations affect the pursuit of an IS/IT education and career is introduced and discussed. Contributions to research and practice are presented.

1. Introduction

In the area of Information Technology (IT), women are largely under-represented in degree programs and the profession [1-9]. Information Technology (IT) is used to refer specifically to computing and computing-related degrees and professions. In addition, retention within an IT degree and within the profession is a challenge. Universities and industry are challenged to recruit and retain more females in IT.

The Bureau of Labor Statistics states that “employment of computer and information technology occupations is projected to grow 12 percent from 2014 to 2024, faster than the average for all occupations. These occupations are expected to add about 488,500

new jobs, from about 3.9 million jobs to about 4.4 million jobs from 2014 to 2024” [10]. The average percentage of women working in the tech industry is 30 percent, based on diversity reports published by 11 of the world's largest tech companies in 2015[11]. In comparison, women make up 59 percent of the US labor force and almost 51 percent of the US population, according to the US Census Bureau.

Recruiting and anchoring (retaining) women in IT, would help fill the need for workers in IT. Studies show that approximately 50 percent of women leave IT jobs within 12 years [12]. Women in STEM (Science, Technology, Engineering, and Math) professions were more likely to leave in the first few years than women in non-STEM related professions. The ‘quit rate’ for females in IT is more than two times what it is for men [13]. A career anchor is defined as “his or her self-concept as they pertain to a career. Once this self-concept has been formed, it functions as a stabilizing force, an anchor, and can be thought of as the values and motives that the person will not give up if forced to make a choice” [14].

The under-representation of women in the IT field is an established phenomena [8, 15]. There have been numerous research efforts in the area [15-17], however, there remains a need to understand the factors of societal structures that may inhibit recruitment and retention of women [18]. According to Myers et al “the picture of why women leave the IT field, or choose not to get into it in the first place, is still incomplete and fragmented [5].” There is significant opportunity to make contributions in the area and to theorize and better understand women’s relationship to information technology [19].

It has been said that computing has an image problem related to social relevance, being a “geeky guy thing”, women feeling like they don’t ‘belong’, and bias in the workplace [20]. Cohoon suggested a change in departmental characteristics that affect retention of women, which would include gender composition, faculty characteristics, faculty attitudes, mentoring, and presence of female faculty [21]. Other suggested strategies include tailoring the message, avoiding negative impressions, mentoring, providing early experience, providing a purpose, and changing the climate. [22-24].

Not only would recruitment and retention of females in IT help close the gap on this demand, it would allow women to experience career opportunities and provide valuable alternative perspectives to the IT field [6, 25]. This complex picture of women's involvement in IT studies offers the motivation to continue researching this area with a fresh combination of theoretical lens, particularly in anchoring factors as women view the IT career area in regards to meeting their goals and dreams.

This research looks at what female IT students indicate as their desires and goals and how they relate to selecting an IT line of study. We then apply this knowledge to help undergraduate programs with recruitment and retention. We look at anchoring the student to an IT path by determining the potential anchors. This research is unique in that the focus is on desires and goals. Most previous research focuses on what female students are currently experiencing, and not on what they hope to attain. By looking at what female students hope to attain, we can more readily seek to anchor them to this area.

This paper is structured as follows: First, we present the theoretical background on career anchors, the individual differences theory and millennial research. Then, we create the theoretical lens for our research. Next, we present the survey research, analysis, and present the CLASS model. The data for this study comes from a qualitative investigation of undergraduate women studying in the IT field in a technology-focused university in North America. We discuss the contributions of the presented theory by showing how an understanding of millennial female students' motivations toward entering an IT field can anchor them to a career and can retain them in their area of study. This will then assist in increasing the representation of women in the IT workforce.

2. Theoretical Background

The career anchor theory was first developed by Schein (1971). Schein defines a career anchor as "his or her self-concept, which consists of self-perceived talents and abilities, basic values, and evolved sense of motives and needs as pertaining to the career." His research shows that this self-concept evolves over time, however once it is formed, "it functions as a stabilizing force, an anchor, and can be thought of as the values and motives that a person will not give up if forced to make a choice [14]." Schein's research found that most people's self-concepts revolve around eight categories: 1) autonomy/independence; 2) security/stability; 3) technical-functional competence; 4) general managerial competence; 5) entrepreneurial creativity; 6) service or dedication to a cause; 7) pure challenge;

8) lifestyle. Our research investigated whether these anchors still hold true for millennial female students or if there is any significant differences.

Schein defined the career anchors as follows:

- Security and Stability – Employment security as a lifetime employee can no longer be relied upon as companies shift and change. Anchoring in this area has to be dependent on oneself. The only thing a person can take from an organization is the opportunity to learn and gain experience. This will cause him or her to be more employable in some other organization.
- Autonomy/Independence – Not being dependent on any particular organization. This group of people have high self-reliance.
- Life Style – Economic security is one aspect. A 'life system' is the larger part of life-style, including personal and family concerns. Autonomy and concern for self are also factors. This area involves organizations supporting the family unit, sabbaticals, and creative ways for employees to complete their work. This could include working from home a portion of the time.
- Technical/functional Competence – Importance of knowledge and skill. Being life-long learners. Organizations need to be knowledge-based.
- General Managerial Competence – This anchor is indicated through leadership and managerial skills. The individual with general management anchor is generally after power, glory, responsibility, accomplishment of a task, the ability to build and manage a team, or a combination of these.
- Entrepreneurial creativity – This area relates to developing one's own business.
- Service/Dedication to a Cause – This anchor shows that individuals want to do something meaningful.
- Pure challenge – This career anchor involves individuals that want to overcome the impossible odds and solve the unsolved problems. They are active learners and want to challenge themselves.

While Schein's research is geared toward career anchoring in general, Igbaria's research found women were more lifestyle oriented and less technically oriented than men in 1991 [26]. Some research found that gender was not a determining factor of career anchors [27, 28]. Quesenberry's research indicated that to address the IT gender gap there needs to be a better understanding of how career anchors are enacted and how women experience this field [29]. Jiang's research results indicated that it is important to develop career plans that match employees wants [30].

Several factors lead to women choosing an IT career. Ahuja discovered the following factors: parent's occupation and attitudes, early computer experiences, social expectations and encouragement,

self-efficacy, and role models. The research found that women are more likely to value extrinsic job attributes such as opportunities to make friends and help others, as well as intrinsic factors such as variety and task enjoyment [31]. This relates directly to Igbaria's indication that women are more lifestyle oriented.

There are several theories concerning women in IT and the gender gap. The essentialism theory characterizes factors to all women [32]. Gender imbalance has been defined as gender essentialism – the biological differences between male and females. While this theory has been widely used, our research will focus on the individual differences of women, and will not characterize all women as having the same goals. We will focus on the individual differences theory which indicates that different factors have different variations [33]. This theory takes into account the varied experiences of women in the IT and is concerned with gender group biases that women encounter and the variation among women with respect to how they respond to these biases [33]. There are three constructs associated with this theory: individual identity, individual influences, and environmental influences. “Collectively these constructs help explain the underrepresentation of women in the IT field by identifying differences among women in the way they relate to the IT field, experience gendered discourses about IT, and respond to them [33].”

The individual differences theory of gender and IT [15, 33] is one component for our theoretical lens to identify the within-gender variation in career anchors for women in the IT workforce. This theory focuses on the different ways women are exposed to, respond to and experience gender relations in the IT profession. The theory looks at the differences in personalities and individual socio-cultural influences. The constructs within this theory help explain the differences among women and how they relate to the IT field. The constructs used within this theory are individual identity, individual differences, and environmental influences.

A generational cohort refers to a group of individuals who experience the same events within the same time intervals, and are typically grouped together by birth dates across a 15-20 year period [34]. The Millennial generation is defined by those who are born approximately from 1980 to 2000 and, we will focus on the trailing millennials (age 14-25) that are currently entering our educational experiences and workplaces [35]. Past research has not tied female IT data with the millennial generational cohorts and the differences in terms of values. According to Twenge, this generation is thought to be more altruistic and have a greater desire to help others and do work that is

worthwhile to society than previous generations. It is more satisfied with their jobs, values leisure, wants more job security than older generations and places high importance on work life balance beginning in high school [36]. In addition, they show increases in individualist traits such as self-esteem and assertiveness.

“As youths, millennial students were influenced by a unique set of forces such as mass media. They are the ones who experienced school lock-downs and increased security. Through all this, they felt the need of steady support from their protective parents concerned about their safety, schooling and academic and extracurricular success [37].” Students in the Millennial generation have been raised in an “environment in which individuality is highly valued and information, entertainment and social interactions are unlimited and at their fingertips [38].” DeBard (2004) presents a set of characteristics that provide a perspective on tendencies of Millennial-generation college students. They are: special, sheltered, confident, conventional, team-oriented, achieving, and pressured[39]. They have a hopeful outlook for the future.

Millennials are described as a generation that holds values, attitudes and expectations that are significantly different from those of the generations of workers that preceded them. The millennial generation (born after 1980) are entering a labor market that is highly competitive, with an increasing proportion of workers holding post-secondary degrees. Although the Millennials are relatively new to the labor market, they are considered to be highly mobile, expect great change and variety in their job assignments [40] and are impatient in terms of their advancement [41]. They are said to emphasize work-life balance and make career decisions that favor lifestyle and leisure over upward career progression [36, 41, 42]. Research indicates millennials placed the greatest importance on individualistic aspects of the job, they had realistic expectations of their first job and salary but were seeking rapid advancement and development of skills. In addition, they are seeking work that ‘ensures a meaningful and satisfying life outside of work’ [41].

Also describes “the ultimate dream job for the millennial generation as the one which offers unlimited career opportunities, plenty of praise and rewards, flexible work hours, casual and fun atmosphere and meteoric rise to the executive suite [35].” Twenge believes that ‘follow your dream’ and ‘you can be anything you want to be’ philosophy of the 90s has led this generation to become narcissistic, focused only on the self and at the same time it is the main reason Millennials’ face disappointments later in life [42].

Our theoretical lens is shown in Figure 1.

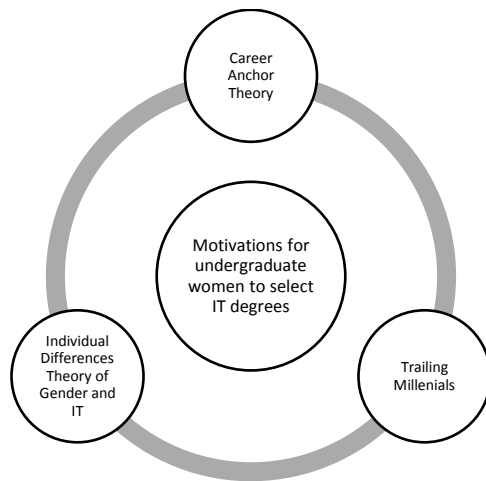


Figure 1: Theoretical Lens

Within this study, we explore the anchors that exist for the female students surveyed. Anchors are seen as key in retention and fulfillment of a career, and in the case of this study, student retention in an IT program. Career anchors can be solidified through identifying student's wants. We identify student's wants through a survey given asking about their goals and desires. By identifying these anchors during a student's undergraduate degree program, a university can implement programs that would help guide and direct students on a satisfying career path causing an increase in retention.

If we can identify what female students' anchors are in the IT field, we will be more successful at retention and individuals will be more likely to stay in an IT related career.

While the individual differences theory looks at gender group biases that women encounter and the variation among women with respect to how they respond to these, we will be looking at how these differences help shape the motivations to study in an IT related degree. The constructs used within this theory are individual identity, individual differences, and environmental influences. Each of these constructs influence a female's goals and dreams.

The theoretical lens will guide our research efforts.

3. Research Methodology

This study uses a qualitative research method to examine female students' perceptions of the Information Systems/Information Technology (IT) educational experience. The guiding research question is: What are the career anchors of millennial female students studying in an IT career path?

The investigation of female student motivations is complex, vague and context specific. The qualitative methods used in this research can yield data from which process relationships and models and richer explanations about how and why processes and outcomes occur can be developed [43]. Qualitative methods provide researchers with the ability to discover relationships from data that is systematically gathered and analyzed [44]. Interpretive method are "aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context [45]." The study approach produced an understanding of student perceptions involved with IT career education path selection.

This study uses open-ended question surveys as the primary data collection and open coding for data analysis. Open coding is used to analyze the data and develop concepts as they relate to female student interaction with the educational process. Open coding analysis enables discovery of the relationships in the real world situation. Theoretical sensitivity allows the researcher to have insight into and to give meaning to the events and happenings in data. "Insights do not just occur haphazardly; rather, they happen to prepared minds during interplay with the data [46]." It allowed being able to see beneath the obvious to discover the new.

The examination of the relationship between female students and career IT education experience broadens the field of IT. The qualitative study focuses on understanding the dynamics present in a setting. The comparison of the emergent concepts, categories, and theories with conflicting concepts, categories, and theories discussed in the literature produces internal validity, and a comparison of emerging concepts, categories, and theories to similar concepts, categories, and theories discussed in the literature produces generalizability [47]. This process continually builds the researcher's theoretical sensitivity.

4. Data Collection and Analysis

The data collection process consisted of an email invitation sent directly to the participant's email account. A survey monkey link was presented in the email invitation to enable the participant to access the survey instrument. The invitation was sent once a week for three weeks. Prior to administering the survey, an Institutional Review Board examined the questions and the survey administration protocol. All institutional procedures were followed for data collection.

Out of the 98 student invitations sent to female College of Computing students, 53 respondents voluntarily participated in the survey for a response rate of 54%. Of the 53 female respondents, 43 of 52 or 83% were in the millennial generation with ages ranging from 18 to 36. They represented students in four academic years as represented in the figure below. This data was collected during Fall semester, 2015.

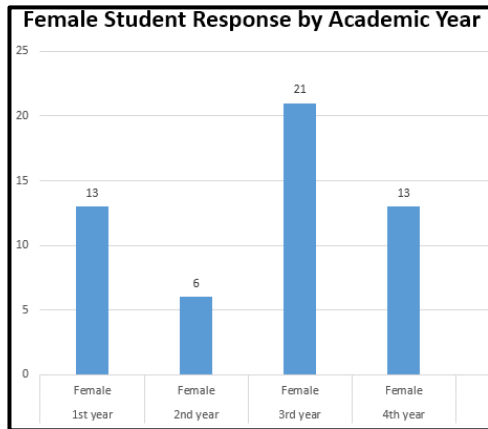


Figure 2: Female student response

While analyzing the transcripts of the survey responses, “labels of meaning” were identified and placed next to the relevant occurrence. Occurrences were events, happenings, actions, feelings, perspectives, actions and interactions. Categorization of the coding was done in two phases by two coders. First, the data obtained from the surveys was coded into broad categories. The survey data was analyzed using Strauss & Corbin’s [46] open coding method. Open coding was used to conceptualize raw data by naming and categorizing the phenomena through close examination of the data. During open coding, data was broken down into discrete parts, closely examined and compared for similarities and differences. The coding process yielded 328 coded quotes. The data representing events, happenings, actions and interactions that were found to be conceptually similar in nature or related in meaning were grouped under abstract concepts that best represent the phenomenon. According to Strauss and Corbin [46], although events or happenings might be discrete elements, the fact that they share common characteristics or related meanings enables them to be grouped. Based on their ability to explain what is going on, certain concepts were grouped under more abstract higher order concepts

which Strauss and Corbin [46] term category. Categories have analytic power because they can have the potential to explain what students may or may not expect from their IT education and careers and may potentially predict the effects of certain expectations on student motivations. The 328 labels were categorized to compare codes across the responses. The categories were derived by tabulating the number of occurrences of related concepts.

Reliability of these groupings was achieved through theoretical sensitivity, iterative coding and theoretical sampling. Strauss and Corbin [46] suggest that theoretical sensitivity is required to enable the researcher to interpret and define data and thus develop relationships, models or theories that are grounded, conceptually dense and well integrated. Sources of theoretical sensitivity are the literature, professional and personal experiences. Additional reliability was achieved through the iterative use of open and axial coding to bring out the concepts and discover any causal relationships or patterns in the data. Strauss and Corbin [45, p.98] state that “though open and axial coding are distinct procedures, when the researcher is actually engaged in the analysis he or she alternates between the two modes”[46]. Along with the groupings of abstract concepts (open coding) and identification of causal conditions (axial coding), that lead to the occurrence or development of a phenomenon, additional coding was carried out iteratively using theoretical sampling.

Further reliability was achieved through theoretical sampling, which is the sampling of data on the basis of concepts that have proven theoretical relevance to evolving relationships, models or theories. The form of open sampling used was open sampling which is associated with open coding. Open sampling was used to select additional interview data. The ‘slices of data’ [48] of all kinds are selected by a process of theoretical sampling, where the researcher decides on analytical grounds where to sample from next. Glaser and Straus [49] state that the researcher does not approach reality as a tabula rasa but must have a perspective that will help him or her abstract significant categories from the data based on the constructs identified in the literature. This data analysis produced the categories of competencies, life system, accomplishment, security, and service. A further analysis revealed subcategories related to each category. Table 1 shows the categories, sub-categories, descriptions and number of occurrences.

Table 1: Anchors			
Categories	Sub-categories	Description	#
Competencies	<i>Life-long learner</i>	Expression of desire to continue to learn	19
	<i>Specific Work/Career Goals</i>	Expression of desire to obtain specific competencies, work or career areas.	54
		Subtotal	73
Life System	<i>Flexibility</i>	Expression of desire for a flexible life and work to complement family and life goals	31
	<i>Career Enjoyment</i>	Expression of desire for career enjoyment	21
		Subtotal	52
Accomplishment	<i>Prestige Honor</i>	Expression of desire for recognition of accomplishments and achievements	32
	<i>Future</i>	Expression of accomplishment in future	15
		Subtotal	47
Security	<i>Monetary Resources</i>	Expression of desire for financial stability	36
	<i>Security</i>	Indication of desire for comfortable, secure lifestyle	12
	<i>Employment Opportunities</i>	Expression of expectation of numerous employment opportunities in field	48
	<i>Hope</i>	Expression of hoping to achieve specified expectations	20
		Subtotal	116
Service	<i>Service Community, Profession, World</i>	Desire to contribute to greater good of community, profession or world	37
		Subtotal	37
		Total	325

The analysis of this research suggests there is a series of influences on female students' desire to pursue IT education and careers. The categories are Competencies, Life System, Accomplishment, Security, and Service (CLASS). These categories illustrate the bundles of meaning related to how the students are motivated by the influences on their intention to pursue their IT goals.

5. Results

In Figure 3 we present the CLASS (Competencies, Life System, Accomplishments, Service & Security) model which illustrates how female student's motivations affect the pursuit of an IT education and career. Undergraduate programs would benefit from helping students anchor to their identifiers in the CLASS model.

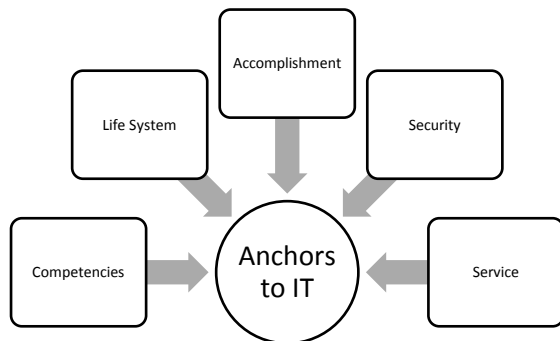


Figure 3: the CLASS model

5.1 Competencies. According to the female student motivations, it is important to gain knowledge and skill and become life-long learners. Relating this anchor to students, would involve helping them develop love for learning - allowing them to be life-long learners. These quotes from the survey illustrate this:

Because I like to learn and grow and this is what this field is it is always growing and changing nothing is ever boring.

Science leads to the truth. Also, I like to learn. With science, the learning never ends.

With the heavily influence technology has on our world today, it seems almost like a requirement for most people to have a solid understanding and education in STEM. My hope is that furthering my education will provide a wealth of opportunities, and I will be able to choose a job I enjoy instead of doing something because that is simply the job/career I could get.

5.2 Life System. This research has shown students are seeking a flexible work life and career enjoyment. These quotes illustrate this:

With the degree I am seeking, I will be able to find a good job or work from home.

I would like to have work-life balance -- time for work, leisure, and my children. I would like

to be financially comfortable and I do not want to be working for the weekend.

5.3 Accomplishment. The desire for students to seek recognition and serve as opinion leaders in areas of technology is consistent with prior digital native and digital immigrant research [50, 51]. These quotes illustrate this:

My major goal in life is to work for a big/up-and-coming company or for the U.S. Military in the network administration field.

I want to be successful. I want to do something important in my life and be able to provide for myself.

5.4 Security. It appears students are seeking economic features of financial success, varied and numerous career opportunities and choice of work and career, as indicated by the instances below:

A STEM degree opens up more possibilities to find a career in a dynamic field. More job opportunities, more room to grow, necessary for future growth in all organizations.

Higher pay, a field I'm passionate about.

I hope to expand my ability to work in software development.

I am currently working in the computer field and I hope my BS will allow me to do a better job.

My hope is that furthering my education will provide a wealth of opportunities, and I will be able to choose a job I enjoy instead of doing something because that is simply the job/career I could get.

A STEM education will help put me on top while pursuing something I enjoy doing.

It will provide me with the knowledge to be successful in the future, as the world advances and becomes more digital.

5.5 Service. The millennial student is motivated to positively contribute to their communities, professions and the greater good. Today, information technology has exposed students to the world's problems. The millennial generation is aware of these problems and desires to help solve the world's problems. Organizations that devote themselves to service will attract the best and brightest of this generation. These quotes illustrate this:

My goal in life is to be encouraging, insightful, and helpful. Providing security and education in areas of technology help companies or individuals who are in need of secure technology and its encompassing aspects.

I want to help other people.

I feel sated when I am helping others.

Building, improving and restoring the human system through technology is the dream. I am an introvert to

the core, but when presented with the opportunity to learn more about others and take their needs, wants and package them for universal use is ideal.

The students are developing competencies, skills and career expectations that are in the IT domain. There is an indication of an understanding of the nature of the IT career and its opportunities. The student perceptions of the skills, competencies and capabilities they possess and are pursuing match the required qualification for employment. The students appear to have an understanding of the necessary preparation for the IT field.

These are mixed with desire for flexibility and opportunity to contribute to community, profession and greater good. The perceptions of 'having it all' for this generation begin to form. And 'having it all' appears to be a blend of career enjoyment, living a life they love, monetary reward and work environment, opportunities to achieve prestige and honor and making a difference in their professions, community and world.

There is a desire for economic stability and expectation of career employment market where there are more opportunities than applications. As students appear to create a unique view of their future, they desire to acquire specific competencies and refine necessary work qualifications for career goals. We see an expression of 'hope' – 'hope' that they can seek and accomplish these intentions blended with expressions of 'future accomplishment'.

Schein administered the career anchor exercise in the 1970s and 1980s. Over 30 years later, there are still similarities in what anchors are important to female students. While the anchors may be similar, the environment and opportunities are quite different, and millennial student's attitudes are different. This study highlighted the emerged anchors for this generation. While the categories of student's needs, goals, and desires are similar, the individual characteristics are different. These categories allow us to see that female students can fulfill those through an IT career.

This research is our first effort to investigate gender in the technical education track preparing for careers in technical fields. Our research contributes by exploring the perceptions and expectation of this audience and presenting the CLASS model to assist in anchoring this audience in their careers. Our model provides the specific contribution of presenting categories of anchors relevant to the new generation of women seeking to enter the IT career path.

Our CLASS model can benefit the industry with a focused effort on motivating women through these anchors towards an IT career choice.

6. Future Research

A relevant and interesting direction for future research is expanding the focus of motivation of IT students. As the focus of IT continues to support many domains, the need for increasing numbers of engaged professionals will be necessary to exploit the benefits of technology. Trailing millennials will continue to change the demographics of professional work groups. An understanding of this generation's career goals and priorities will enable creation of career paths and work environments to provide development and retention of millennial workers.

Future research has the potential to be expanded to both genders and could expand to compare these two groups of individuals. New insights and models could be developed to provide additional understanding of all students pursuing the IT career path direction.

Also, an interesting avenue would be to look at the motivations of female students that leave this industry.

7. Conclusion

This study employed a qualitative survey design to discover the motivations of female IT students to pursue IT degrees and prepare to enter their careers. The categories illustrate the bundles of meaning related to how students perceive motivations toward their futures which can anchor them to an IT degree and career.

It is an important area of study to provide insights for discovering female student's motivations and intentions toward the field of IT education and careers. As Simon predicted, "Technology creates the possibilities, but it is we, through our plans and decisions, who determine which of them will be realized, and what the consequences will be for human welfare"[52]. It is up to us to create the consequences and environments to leverage our most important assets – our people.

Practice can benefit from understanding the female student perceptions and expectations. Millennials are described as a generation that holds values, attitudes and expectations that are significantly different from those of the generations of workers that preceded them. A better understanding of Millennials' career expectations and priorities may help employers to create job offerings and work environments that are more likely to engage and retain these workers. The secondary education institutions can utilize the

information to transition the student through the educational experience and future employers can utilize the information to transition and retain new employees in their organizations. As this sample represented women IT students, an understanding of women currently studying in the IT field would allow for better development of programs and recruitment. With this knowledge, universities can be better equipped to understand their female population in pursuing these degrees and work towards increasing recruitment and retention. This information could help practitioners develop strategies to optimize the transition of students into IT education, through the educational experience and into successful IT careers. Ultimately, it can contribute to improved participation of females in IT education and IT careers.

To help young women to see the value of an IT career and how it relates to their goals and desires, we first needed to understand these ideals. This study sought to identify key motivational factors and important self-concept anchors for women studying in IT. To identify and help a student anchor to this career direction would be beneficial for helping to close the gender gap and fill the need for IT workers.

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