

Factors influencing Software Engineering Career Choice of Andean Indigenous

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ABSTRACT

A diverse workforce is not just “nice to have”, it is a reflection of a changing world. Such a diverse workforce brings high value to organizations and it is essential for developing the national technological innovation, economic vitality, and global competitiveness. Despite the importance of diversity in the broad field of computing, there is not only a comparatively low representation of women but also other underrepresented minorities, such as indigenous people. To gain insights about their career choice, we conducted 10 interviews with Andean indigenous. The findings reveal that seven factors (social support, exposure to digital technology, autonomy of use, purpose of use, digital skill, identity, and work ethic) help to understand how and why indigenous people choose a career related to Software Engineering. This exploratory study also contributes to challenge common stereotypes and perceptions about indigenous people as low-qualified workers, academically untalented, and unmotivated.

CCS CONCEPTS

•Social and professional topics~Professional topics~Computing profession~Computing occupations

KEYWORDS

Software Engineering, Career choice, Genre, Ethnicity, Diversity

1 Introduction

As software organizations become global, diversity becomes a feature of software development teams. Although diversity is a big challenge in the software industry, it is being embraced by several companies such as Google, Microsoft and Facebook. Diversity can be expressed in different ways such as nationalities, gender, minorities, cultures, life styles and world views [1]. In Computer Science, it has been widely discussed that some underrepresented profiles exist. For instance, according to a large survey carried out in United States [6], there is not only a comparatively low representation of women in STEM but also, there are other underrepresented minorities such as Blacks and Latinos. However, studies in other geographical locations such as South America could provide a more rich, nuanced and actionable view of this topic. In particular, to the best of our knowledge, it is

little known how career interest of Andean indigenous evolves over time.

According to a study published in 2017 about the promising practices in supporting success for indigenous students [3], indigenous values and approaches are increasingly being pursued as global directions for educational policies. For instance, lifelong learning is integral to indigenous cultures and Sustainable Development Goals (SDGs) on education [3]. Thus, indigenous perspective can open new opportunities for innovation as well as enrich and improve the Software Engineering (SE) field in terms of sustainability and diversity. In support of that, “The Software Industry and Developing Countries” report [7] highlighted that professionals in the local software industry could understand best local cultural dynamics and produce solutions tailored to local needs and capabilities.

Despite that there are many competing theoretical approaches to explain and predict general and STEM career choices, person-centered analysis through qualitative approaches is still necessary in order to identify the factors that shape career choice of underrepresented minorities [2]. In this paper, we focus on the factors influencing SE career choice of Andean indigenous. To do so, we carried out 10 interviews during September–October 2019. Then, three coding techniques proposed by grounded theory [4, 5] were applied to assist us in analyzing qualitative data: open coding, axial coding and selective coding. The qualitative research tool NVivo 12 was also used in order to help us to code the interview transcript and linking the codes.

3 Results

This section presents the demographic information of the participants (see Table 1). All participants were either college students (3) or software workers (7). The findings are categorized into seven factors that make up the career choice of the Andean indigenous people in this study.

a. Social Support, all participants in this study reported social support to some extent. They received emotional support from their family and/or friends. In spite of having low family incomes, their parents acknowledged the importance of higher education as a way to overcome poverty and exclusion. Indeed, some of them had grown up without electricity or running water and three families migrated to the city to take advantage of the better education facilities. Moreover, all participants admitted that their

career choice is “uncommon” among indigenous people and 6 of them found it impossible to mention another student or professional in this field. This reveals a lack of role models, thus they found inspiration in indigenous professionals of other areas.

Table 1. Demographic information

IT/SE work experience	No experience (1); Summer Internship (1); 1 year (4); 3 years (2); 10+ years (2)
Family income level	Lower Class (7); Lower Middle Class (2); Middle Class (1)
Ethnicity	Ecuador (Quechua) : Tomabela (3); Otavalo (2); Puruhá (2); Kayambi (1); Bolivia : Aymara (2)
Gender	Male (7); Female (3)
Age group	20-24 years (5); 28-33 years (3); 39 years and over (2)

b. Exposure to digital technology, all participants mentioned interest in digital technologies. They experienced curiosity and wonder, and they developed a growing interest on computers that many indigenous people are still lacking. For them, it was a mark of privilege to have access to a computer or internet at home. In fact, only two respondents owned them at a young age. All participants also admitted that they did not know how broad the computer science field was before enrolling in college, and, in particular, they did not know that SE was a viable career option.

c. Autonomy of Use, freedom to use the technology in any desirable way was a major limitation for most of the participants. As a consequence, they found it difficult to progress at the college without their own computer.

d. Digital Skill, participants, who achieved autonomy of use at a young age, developed advanced technical skills to use computers and applications to accomplish practical tasks. Indeed, all participants identified programming as one of their skills and three of them reported having learned on their own. In general, skills to use digital technologies based on creativity, critical thinking and problem solving were discussed by all participants.

e. Purpose of Use, entertainment was the initial purpose to use technology for most of the participants. However, at some point, they realized that technology can be a way to improve their economic condition. More explicitly, they mentioned that such a career is an opportunity to get a job and get away from poverty. In addition, nine of the indigenous discussed in their interviews “improving human and planetary wellbeing”, i.e. “make the world a better place”, as one of their purposes.

f. Identity, all participants were proud to be indigenous although most of them confessed to speak Spanish much better than their traditional language. Ethnic discrimination was reported by five of seven men, in this case, the other two men reported that they have not worn traditional clothes. On the other hand, only one of three women experienced discrimination and she grew up in a non-urban area in Bolivia while the other two women grew up in urban areas of Ecuador. However, one of the two women displayed hardness just like some men, who experienced discrimination.

g. Work ethic, each participant depicted more than one of the following subcategories as the source of their work ethic: i) a refusal to fail in college; ii) a desire to go back to their communities and inspire others; iii) a desire to share their knowledge; vi) expectation from family to accomplish great things; v) realization that “*runas [indigenous] professionals*” are underrepresented in this field; and vi) a desire to improve human and planetary wellbeing including personal wellbeing.

4 Conclusions

This study aims to understand how Andean indigenous people made the jump from a group that is woefully underrepresented in SE to professionals in that same field. The findings reveal seven factors that comprise career choice of Andean indigenous people. Despite that the small sample is a major limitation, these factors should be taken into account in future research. Drawing attention to indigenous professionals in the local software industries could produce solutions tailored to local needs and capabilities.

Elevating the voices of indigenous men and women, we hope that this study will foster interest in research on ethnic and gender differences in SE career choice and enhances a better understanding of this phenomenon while promoting equity of opportunities within the scope of SE.

REFERENCES

- [1] Hazzan, O. and Dubinsky, Y. 2006. Can Diversity in Global Software Development Be Enhanced by Agile Software Development? *Proceedings of the 2006 International Workshop on Global Software Development for the Practitioner* (New York, NY, USA, 2006), 58–61.
- [2] Joshi, K.D., Kvasny, L., Unnikrishnan, P. and Trauth, E. 2016. How Do Black Men Succeed in IT Careers? The Effects of Capital. *2016 49th Hawaii International Conference on System Sciences* (Jan. 2016), 4729–4738.
- [3] OECD 2017. Promising Practices in Supporting Success for Indigenous Students. OECD Publishing, Paris.
- [4] Sánchez-Gordón, M.-L. and O’Connor, R.V. 2015. Understanding the gap between software process practices and actual practice in very small companies. *Software Quality Journal*. (May 2015). DOI:https://doi.org/10.1007/s11219-015-9282-6.
- [5] Strauss, A. and Corbin, J.M. 1998. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. SAGE Publications, Inc.
- [6] Trauth, E.M., Cain, C.C., Joshi, K.D., Kvasny, L. and Booth, K. 2012. Embracing Intersectionality in Gender and IT Career Choice Research. *Proceedings of the 50th Annual Conference on Computers and People Research* (New York, NY, USA, 2012), 199–212.
- [7] UNCTAD 2012. *Information economy report 2012: the software industry and developing countries*. United Nations Publications.