

# Evaluation of the Impact of Mentoring on the Development of Technological Tools of Women in the Textile Sector in High Andean Regions.

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## Abstract

This study focuses on evaluating the influence of mentoring in technological tools on women operating in the textile sector in the high Andean areas of Cusco, Puno, Tacna, Moquegua and Arequipa in southern Peru. To measure this impact, surveys were conducted before and after the virtual mentorships, focusing on the acquisition of basic level technology skills, such as Google search, use of Canva and social media management. The results indicate that the mentorships have influenced the development of technology skills among the participants. Pre-mentoring surveys revealed a generalized lack in most of these skills, with limited knowledge in the use of tools such as search engines and graphic design platforms. However, post-mentoring surveys showed improvements in these areas. This study highlights the importance of mentoring in the development of basic technological skills, empowering women in the textile sector in the high Andean regions. These results suggest that mentoring can play a key role in closing technology gaps and improving the active participation of this demographic group in the digital economy and society in general.

## Keywords

Mentoring, technologies tools, High Andean Regions.

## 1. Introduction

Peru is one of the countries with the world's highest concentration of domestic camelids such as alpacas, llamas, and vicuñas located in the high Andean zones (3800 to 4700 m.a.s.l.), where fiber production and activities derived from them in the textile sector are of great importance. According to ComexPerú, Peru is the leading producer of camelid fiber textile products at the large, medium, small, and microenterprise levels, which in many cases are identified by associations led by women of different ages. The National Institute of Statistics and Informatics (INEI) reported that in the first quarter of 2020 a total of 20,697 companies were led by women (53.7%), within this it is considered that 22.5% correspond to women who report higher rates of entrepreneurship in micro and small enterprises than men (21.9%), according to this the Fintech brings together startups dedicated to financial services based on new technologies where women lead 44% of these companies.

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Entrepreneurship, traditionally associated with men globally. (Astorga, 2019) has experienced a notable increase in the participation of women, especially in Latin America, where both men and women have high rates of entrepreneurship (Segarra et al., 2020). This phenomenon is attributed, among other reasons, to the limited accessibility of job opportunities for women compared to men. In other Latin American countries, entrepreneurship arises out of necessity rather than opportunity, given the limited employment options for women in the conventional labor market (Estrada et al., 2020). (Estrada et al., 2020; Uzcategui Sánchez et al., 2017). In Peru, 63 % of women entrepreneurs have completed technical studies, 44 % take risks, 68 % are willing to learn from their mistakes, 65 % have other stable income, 82 % are willing to learn, 50 % consider that age is a relevant factor for entrepreneurship and that it is easier for young women to undertake entrepreneurship (Vasquez Lopez, 2018). According to the above, a scenario was experienced due to the COVID-19 pandemic which has had an adverse impact on various economic sectors, being tourism and the textile sector especially affected due to restrictions on the export of products for large companies and limitations in the tourism field affecting small and micro enterprises. In this context, before the pandemic, 45 % of the enterprises were led by women; after the pandemic, this percentage increased to 68 %. Necessity entrepreneurship has a higher rate than opportunity entrepreneurship. For 38% of women entrepreneurs, entrepreneurship is the main source of income, while for 22% it is a temporary source and for 33% it is an important source of income. (DATUM, 2020)

As a result of the health, economic and social crisis generated by the pandemic, we found the need to strengthen women's entrepreneurship, focusing especially on the rural areas of the country. These areas harbor significant potential among young women who are willing to start textile enterprises. In this context, the present research aims to evaluate the impact of mentoring in the high Andean regions that have experienced negative repercussions due to the COVID-19 pandemic. This study will focus specifically on the regions of Puno, Moquegua, Tacna, Cusco and Arequipa, benefiting predominantly young women, as well as those of adult age, who are engaged in textile activities.

## **2. Materials and methods**

### **2.1. Population and Study area**

The study area was delimited in southern Peru; the selected regions were Arequipa, Cusco, Puno, Moquegua and Tacna. The selection criteria were determined due to the establishment of textile associations with a traditional focus on women in these regions, in addition, this activity is mostly associated with work in the high Andean zones (Aliaga Saenz, 2023). (Aliaga Saenz, 2023). The selected association in Arequipa is located in the district of Tisco, in the province of Caylloma, where 24 women belonging to this association were evaluated; however, due to the fact that the places where textile associations are present are remote, the majority of these 24 women belonged to other associations, thus becoming a large network of people in this high Andean textile sector. In the Puno region, the location of the selected textile association was Chucuito, 19.4 km from the city, and it is located at 3875 meters above sea level. This association is made up of 13 women and presents the same situation as the association evaluated in Tisco, so the artisanal textile networks in these study areas are much larger. Next, the city of Cusco, one of the areas with an outstanding cultural belonging, was established in the district of Chincheros at 3754 meters above sea level with an association of 20 women with the same characteristics as the previous regions. On the other hand, the regions of Moquegua and Tacna present a similarity, the artisanal textile associations are disarticulated, some are inactive, and others disappeared, so no evaluation was conducted in these locations, however, it was possible to rescue information on the critical state of the textile associations in these locations. These populations had access to internet, some areas with limitations, however, most of them had mobile equipment, which made our study population good candidates to apply mentoring in technological tools. By having an approach to physical/digital tools, the selected population presented aptitudes to obtain the most

knowledge in technological tools, however, the knowledge of those tools was very limited. The remote locations and the geography of the Peruvian altiplano prevented all associations from having telephone and internet services (Auladell et al. (Auladell et al., 2020). For this reason, information on the use of useful tools is scarce in this type of study area. Finally, the age of the participants was established in a range of 18 to 40 years. The cultures belonging to the Peruvian highlands have been responsible for different activities, among them the elaboration of textiles (Vargas, 2019). For this reason, in 2022 the new Law No. 29073 and the Regulation of the National Registry of Artisans and the National Council for the Promotion of Artisan D.S. 001-2008-MINCETUR and development of artisan activity were established with the aim of recognizing and valuing the artisan as a way of cultural, identity and traditional construction of the country. The Ministry of Tourism is the entity that proposes, coordinates, regulates and evaluates policies for artisans, including textile artisans. Thanks to this type of policies, they allow the revaluation of this group of people and can have a scope for investment in addition to expanding the activity in an economic and innovative way. (Tian et al., 2018). When selecting the study groups, it was taken into consideration that the textile craftswomen produce textiles with cultural belonging, since this quality of artisan textiles needs greater visibility.

## **2.2. Theoretical background of technological tools in high Andean areas**

The COVID-19 pandemic has generated a global crisis that has impacted several sectors, with tourism being one of the most affected (Gabriel-Campos et al., 2021; Higgins-Desbiolles, 2020). (Gabriel-Campos et al., 2021; Higgins-Desbiolles, 2020).. This impact is of great importance given that tourism is one of the driving sectors that drive the country's economy, which has a direct effect on the textile sector and in particular on the high Andean regions. In these regions, the economic livelihood depends largely on tourists who visit and purchase products, both handicrafts and textile fabrics characteristic of each high Andean zone, which exacerbated the economic challenges for artisans and small textile entrepreneurs in these regions. In addition, dependence on the informal economy and lack of access to financial resources hindered the resilience of this sector. In the aftermath of the pandemic, the Peruvian government and other entities have initiated efforts to reactivate the textile sector, adapting to the digital era by using technological tools such as social networks to promote their products. In this context, the importance of training and updating the affected populations through mentoring, both face-to-face and virtual, has been recognized. These mentorships are presented as a key strategy to enhance the adaptation of the sector to the new technological dynamics and promote its economic recovery.

Accordingly, several authors have conducted studies on the use of mentoring, as follows Oyarzún-Cristi & Sanhueza-Martínez, (2021) carried out a mentoring work with indigenous beneficiaries during 2020 in the framework of the UN Women's Indigenous Women Program, showing as a result 36 women benefited from this initiative, of which 33% managed to raise non-reimbursable funding to implement their plans and businesses. Likewise, Buendía-Martínez & Carrasco (2013) in their study analyzed the relationships between female empowerment, entrepreneurial activity and rural development in Latin America using a Structural Equation Model, with the Partial Least Squares technique, showing results that confirm the dependency relationships between female empowerment and rural development through entrepreneurial activity and development. (Castillo et al., 2020) conducted a systematic literature review on female empowerment in rural entrepreneurship under a search methodology of bibliographic references contextualized in issues of female empowerment, entrepreneurship, gender, participation and female leadership, resulting in several studies focused on analyzing rural and indigenous female entrepreneurship, public policy with a gender perspective, female empowerment in organizations and rural development of communities; the evidence invites to reflect on gender policies and conditions of rights of rural women, to reduce discrimination by society and state.

On the other hand, Headlam-Wells et al. (2005) highlights the relevance and transformative potential of e- mentoring for professional women, as evidenced in the Empathy-Edge program in

the United Kingdom. With 122 participants matched through psychological profiling, the study revealed the benefits and challenges, advocating e-mentoring as a key tool for career development and overcoming the "glass ceiling". It also highlights the strategic importance of psychological profiling in matching. This novel approach, integrating mentoring, gender in management and computer-mediated communication, brought originality to the field, underlining the need to explore e-mentoring from a European perspective. Similarly Crawford & Smith (2005) conducted a study addressing the importance of mentoring in African American women's selection of higher education as a career choice and in their development as professionals in that career. The research provided recommendations on how African American women administrators in higher education can further advance their career choices and development. Mentoring has been identified as a factor leading to upward mobility in employment, success in education, and personal development.

A recent study by Tinoco-Giraldo et al.(2020)shows the design of a mobile application called e-mentoring to improve communication and matching in university mentoring processes. A diagnosis of existing applications is made, requirements for the mobile design are identified and a model that addresses social, graphic, technological and legal factors is proposed. The application seeks to be a meeting point for students and mentors, strengthening academic links. The design is based on previous models, highlighting its usefulness in streamlining educational processes and generating community. The initiative promises to contribute significantly to the quality and efficiency of educational services.

Based on the above, various methodologies have been identified to implement mentoring, which has an important impact on the sector under study. This highlights the importance of conducting mentoring either face-to-face or virtually, as effectiveness depends on adaptability, effective communication and personalized approach to achieve specific objectives. This approach is crucial for the target group, fostering leadership, personal development and overcoming challenges, thus promoting equity and prosperity in the Andean communities of the study.

Likewise, mentoring women in high Andean regions strengthens female entrepreneurship by considering a methodological model that allows them to be effective in their efforts to generate improvements. In this sense, mentoring is a model that has been shown to be effective in fostering entrepreneurship (Portuguez-Castro & Gómez- Zermeno, 2002). (Portuguez-Castro & Gómez-Zermeno, 2020).

### **2.3. Measuring instrument**

Two tools were considered for this study, surveys and personal interviews. The surveys had two parts as part of an evaluation, pre and post mentoring, this to know the current state of our study population talking about technological tools. This tool was applied in the regions with a significant number of people per association. On the other hand, the regions that presented disintegrated or disjointed associations were personally interviewed to determine the reasons for this occurrence. After obtaining the information from the associations, a plan of virtual workshops was implemented, which were made up of platforms such as Google forms, Canva, Google search and social networks. These digital tools were considered as they are basic for the development of necessary capacities and important skills in the textile commercial area within the reach of the associations in southern Peru. The cross-cutting competencies survey was reviewed by a group of experts and statistically analyzed for reliability and validity (Agarwal, 2011)

### **2.4. Mentoring development**

The mentoring program in technological tools which is called as "PROMETEC MUJER" starts with the creation of a web page of free access for the application of face-to-face and virtual mentoring for a long-term projection with the associations where you can find all the didactic material, experiences and the database of the information collected according to previous segments of this research in the high Andean regions of southern Peru such as Cusco, Puno,

Arequipa, Moquegua and Tacna, Puno, Arequipa, Moquegua and Tacna, with the vision of contributing to the development of necessary capacities and important skills in the commercial textile area within the reach of the associations of southern Peru, economic and social empowerment of its participants so that they assume leadership in their community in each region. Therefore, the method used was Flangant's critical incident technique (Agarwal, 2011; Ser Ser Ser, 2011). (Agarwal, 2011; Serrat, 2017) which consists of data collection, deciphering the goals of the results sought and data interpretation.

## 2.5. Statistical analysis

Descriptive statistics analyses (mean, standard deviation, coefficient of variation and normality) were performed, in addition to inferential analyses using the paired samples t-test to evaluate the effect of the mentoring program. In addition, an ANOVA was used to evaluate the differences between the Pre-test and Post-test. A 95% confidence level was assumed in all analyses. Analyses were performed using OriginLab Pro statistical software.

## 3. Results and discussion

### 3.1. Mentoring development

The workshops focused on technological tools were applied to the associations in the different regions. At the beginning, prior to the application of the workshops, a pre-test was applied in person to determine which competencies were present and which were not. As detailed in Table 1, the competencies applied in the workshops, such as Internet search, which were initially complicated, Google forms and social networks were the easiest workshops for the study population to understand. One of the most relevant issues was the time of each workshop, since the attention in each participant decreased greatly through the exposure time.

The technological tools applied had a logical order in order to reach an optimal learning of the basics of each workshop. The internet search internalized in the study population the importance of keywords and quality content necessary for their search objective, in addition, information from reliable web sources was provided. The following course served mostly to complement logic and coherence as well as questionnaire management. In addition, it served for the creation of the post-test as a test template and to speed up data processing in the post-test evaluation. The next tool was developed to increase creativity and critical thinking in the context of textile garments, since the area of focus was textile craftswomen. Finally, the last item of the workshops were the social networks, which served primarily with the objective of expanding their contacts in an assertive way and the basics of business accounts for dissemination of their ventures.

**Table 1**

**Mentoring Development Summary**

<b>1st mentoring 14/8/2023 Internet search</b>	<b>2nd mentoring 11/9/2023 Google forms</b>	<b>3rd mentoring 18/9/2023 Canva</b>	<b>4th mentoring 11/10/2023 Social networks</b>
This workshop lasted 2 hours, the main aspects discussed were keywords in Google, search for information from reliable sources, account setup and/or email creation.	This workshop lasted 2 hours, and the main aspects covered were web platform entry, form creation, question editing, question sorting, form saving and form submission via link.	This workshop lasted 3 hours and the main aspects covered were: access to the web platform, registration on the web platform, creation of new documents, creation of documents through templates, text editing, the "insert" function, image editing,	This workshop lasted 2 hours, the main aspects exposed were the basics of using Instagram, Facebook and WhatsApp business accounts.

insertion of graphic elements, and the use of the "insert" function.

### 3.2. Statistical analysis

In the context of social research in the high Andean regions of Cusco, Arequipa and Puno, a statistical analysis was carried out that addressed normality tests and descriptive analysis of the data obtained in pre-test and post-test. The results of the normality test, expressed in p-values, reveal that the data of the population under study are within a normal distribution. As for the descriptive analysis of the data, fundamental metrics such as the coefficient of variation, deviation and standard error were evaluated. The coefficient of variation, which does not exceed 30% in all regions, indicates a certain uniformity in the variability of the data; this pattern suggests stability in the measurements. The standard deviation, varying between 3 and 8 for all regions, indicates the dispersion of the data with respect to the mean. The observed variability can be attributed to the inherent heterogeneity in the samples analyzed, highlighting the importance of addressing diversity in future analyses. The standard error, ranging from 0 to 2 for all regions, indicates an accurate and consistent estimate based on the samples. This low level of error provides confidence in the precision of the measurements, despite deviations from normality. These results underscore the need for caution and the importance of considering sample heterogeneity in study design and analysis.

**Table 2**  
**Normality test**

		Statistician	p-value	Decision at 5%.
TISCO	Pre test	0.95853	0.40967	Does not reject normality
	Post test	0.9473	0.2366	Does not reject normality
CHUCHUITO	Pre test	0.9534	0.65065	Does not reject normality
	Post test	0.88348	0.07951	Does not reject normality
CHINCHEROS	Pre test	0.9169	0.08636	Does not reject normality
	Post test	0.90471	0.05059	Does not reject normality

**Table 3**  
**Normality test**

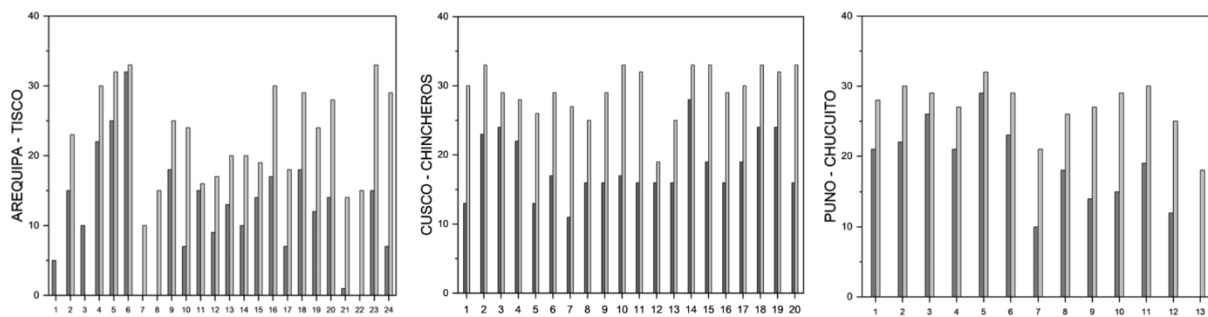
		Mean	Desv Std	SE of var	Variance	Coef of var	Min	Avg	Max
TISCO	Pre test	11.91667	8.0645	1.64616	65.03623	0.27674	0	12	32
	Post test	22.54167	6.72425	1.37258	45.21558	0.2983	10	20	33
CHUCHUITO	Pre test	17.69231	7.59808	2.10733	57.73077	0.22946	0	18	29
	Post test	27	3.85141	1.06819	14.83333	0.14264	18	27	32
CHINCHEROS	Pre test	18.3	4.46153	0.99763	19.90526	0.2438	11	16	28
	Post test	29.4	3.69067	0.82526	13.62105	0.12553	19	29	33

Figure 1 shows the comparison between the Pre-test and Post-test applied to women's associations in the Alto Andean textile area, offering a valuable perspective on the effectiveness of mentoring and its impact on skills related to specific technological tools. The differences and positive results between both moments are significant indicators of the benefits obtained. In the pre-test, women's initial skills and knowledge of technological tools are assessed, providing a baseline for understanding their level of competence prior to receiving mentoring. At this point, it is possible to identify areas of opportunity and determine specific training needs. On the other

hand, the post-test is applied after the mentoring, serving as a post-evaluation to measure the impact of the mentoring sessions on the development of technological skills.

Differences between pre-test and post-test scores reflect the progress and improvements achieved throughout the mentoring. A positive change in scores indicates an increase in technological skills and knowledge acquired during the mentoring period. In this case, the results indicate substantial improvements in the management of specific technological tools, such as Google, internet search, Canva, Google Forms and integration of social networks such as Instagram and WhatsApp. The improvement in these technological capabilities suggests that the mentorships have had a positive impact and have achieved their objectives of strengthening the digital skills of women in the Alto Andean textile area. This result is particularly encouraging as it demonstrates the effectiveness of mentoring

interventions in the specific context of women's associations in this sector. These findings also support the idea that mentoring can be an effective strategy to close technology skills gaps and train women in digital tools relevant to their textile activities. Furthermore, this positive experience could inspire the implementation of similar programs in other communities, thus contributing to the strengthening of technological skills and empowerment of women in similar contexts.



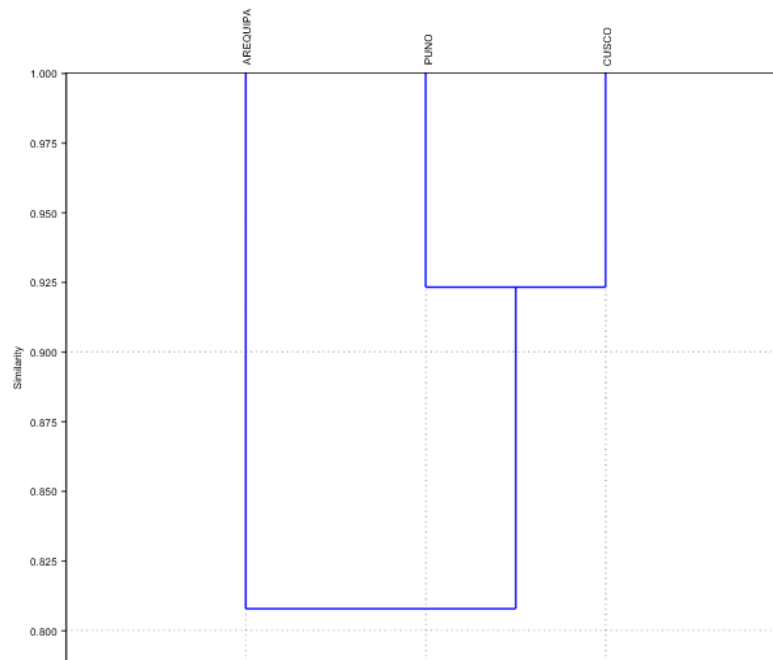
**Figure 1:** Comparison between the results of the Pre-test (left bar) and Post-test (right bar) carried out in the Regions of Arequipa - Tisco, Puno - Chucuito and Cusco - Chincheros.

Google, internet search, Canva, Google Forms and integration of social networks such as Instagram and WhatsApp. The improvement in these technological capabilities suggests that the mentorships have had a positive impact and have achieved their objectives of strengthening the digital skills of women in the Alto Andean textile area. This result is particularly encouraging as it demonstrates the effectiveness of mentoring

Figure 2 shows the construction of a dendrogram using Jaccard's similarity test between the study populations in the regions of Arequipa, Puno and Cusco providing a graphical representation of the similarity relationships between these geographical areas. In the dendrogram, distances between populations are calculated using Jaccard's index, which measures the similarity between sets, being particularly useful when working with binary data, such as the presence or absence of certain elements.

Notably, the result reveals that the regions of Puno and Cusco are the most similar to each other. This finding may have significant implications, especially when considering women's textile associations and the results of a pre-test on technological tools. The similarity between Puno and Cusco could indicate that they share similar socioeconomic, cultural or geographic contexts, factors that could influence the creation and sustainability of women-led textile associations in both regions. It could suggest that successful strategies implemented in one region could be transferable or adapted to the other, promoting an exchange of good practices. In relation to the pre-test on technological tools, the similarity between Puno and Cusco could indicate common patterns of access, use and perception of technologies among the study populations. This knowledge may be valuable when designing interventions or programs

involving the use of technological tools, since effective strategies implemented in one region may be applicable and effective in the other.



**Figure 2:** Jaccard's test of similarity between the pre-test scores evaluated in the regions.

On the other hand, regarding the current situation in the Moquegua region, an exhaustive review and search of textile associations led by women revealed a lack of organization among the different associations. This situation is attributed to various factors, one of which is the predominant temperate climate on the coast of Moquegua, characterized by its uniformity throughout the year, with variations in the average temperature between 14°C (in August) and 25°C (in February). In the coastal area, close to the mountain range, there is a dry desert climate that extends to the Andean region. This condition has led to non-textile handicrafts having greater acceptance in the region than textile garments, since these are more attractive in colder climates such as the Puno Region, Cusco and Arequipa.

According to the above, an interview was conducted with the president of the representative association who pointed out that Moquegua lacks adequate promotion to attract tourists to the area because they did not have an establishment for the marketing of their products, also indicated that at present it does not have a Center for productive innovation and technology transfer also called CITE TEXTIL, which is essential for the economic development of enterprises in the sector. Accordingly, the Management of Economic and Social Development plans to promote strategies for financing in the textile sector, seeking to market not only the region's own non-textile handicrafts, but also textile garments. This approach seeks to avoid the disintegration of existing associations, promoting instead a proactive reactivation in line with the region's tourism promotion initiatives.

Similarly, the situation in the Tacna Region presents similarities in terms of the fundamental elements to promote the development of the textile sector. Some of the characteristics of the variables in the Tacna region are the lack of interest on the part of the authorities, despite the existence of the Artisans Law, which was established in favor of artisans to promote the development of artisans and crafts in their various forms, integrating them into the country's economic development; facilitate artisans' access to private financing; and improve their productivity, competitiveness, profitability and market management conditions. It should also be noted that the objective of the Regional Directorates of Foreign Trade and Tourism (DIRCETUR) is to plan, execute, direct, supervise and evaluate development actions in the foreign trade, tourism and handicrafts sectors. This approach seeks to promote both domestic and foreign tourism in the region (TACNA: Economic Activity Synthesis, 2022). However, the availability of



specific locations for the commercialization of handcrafted textile products is even scarcer, given that the Regional Government persists in denying the allocation of permanent establishments for the promotion and sale of textile handicrafts in Tacna. In this regard, during an interview with one of the active members, it was pointed out that despite government recognition as artisans, they are unable to obtain the necessary relevance. This lack of recognition has a direct impact on the stagnation of the associations' development, leading to possible future disintegration and relegating the entire handicraft sector to the background.

On the other hand, one of the activities with the greatest potential in the Tacna region could be tourism, since the border country Chile has a great interest in this type of products with cultural themes, likewise, there is a radical change as the regions move away from climatic variables, since in areas such as Tisco, Chincheros and Chucuito the use of handicrafts with cultural styles of the country is highlighted, while Moquegua and Tacna tend to have updated garments, textiles with camelid material, but without the characteristic cultural identity. This may be due to the target public in the commercialization of garments, since it varies in each region, while the regions located in Cusco, Puno or Arequipa receive a large number of tourists, the Tacna and Moquegua regions do not, which is why the change in the type of textile is necessary to reach other groups interested in textile products.

## **4. Conclusions**

This study focused on evaluating the impact of mentoring in technological tools among women in the textile sector in the high Andean regions of southern Peru. Surveys were conducted before and after the virtual mentorships, focusing on basic technology skills such as Google search, Canva use and social media management. Initial surveys revealed a generalized lack of these skills. However, subsequent surveys indicated significant improvements, highlighting the positive impact of mentoring on technology skills development. This study underscores the relevance of mentoring in closing specific technology gaps in the high Andean regions. Observable progress in essential skills, such as the use of search engines and design platforms, suggests that mentorships play a crucial role in equipping and empowering women in the textile sector. The importance of focusing on core skills highlights the need to adapt to today's digital age. These results not only have technological, but also economic and social implications. Improving technology skills can increase active participation and inclusion in the digital economy, contributing to greater diversity in society. In summary, this study highlights the effectiveness of mentoring in bridging technology gaps, empowering women in the textile sector and promoting more active participation in the digital economy and society.

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