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Print ISSN: [3006-2497](#) Online ISSN: [3006-2500](#)Platform & Workflow by: [Open Journal Systems](#)**Examining the Role of Technological Innovation in Fostering Entrepreneurship in Gilgit-Baltistan****¹Jahangir Alam***

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Sadaf.ambreen@ii.edu.pk**Abstract**

The study's main goal is to analyze how digital skills affect businesses, society, and entrepreneurs in the Gilgit region. It also explores the extent to which diverse populations, including underprivileged communities, are adopting and innovating with digital skills. To ensure equitable representation of the population, the methodology used a determined sample size of 383 entrepreneurs and data gathering through random sampling. With SPSS, data analysis was done.

This research presents a number of important findings. First of all, it finds a strong positive relationship between the adoption of technological innovation and information technology. This relationship highlights how IT has a transformative effect on fostering innovation among entrepreneurs in Gilgit Baltistan and highlights its critical role in the quickly changing technological landscape.

Moreover, the correlation that exists between entrepreneurial activities and information technology underscores the capacity of IT to promote an entrepreneurial environment by enabling virtual networks and commercial prospects. This is especially true in Gilgit Baltistan, where creative startups are finding that digital tools are becoming more and more necessary.

The adoption of technological innovation and entrepreneurship are acknowledged to have a positive, albeit less significant, correlation in the article, with varying degrees of this connection depending on the particular context. Especially in the setting of Gilgit Baltistan, the comparatively low correlations with digital skills beg the question of how they affect innovation and entrepreneurship. More research is necessary to comprehend the intricate relationships between all of these factors in the area.

Keywords: Entrepreneurship, Technological Innovation, Gilgit-Baltistan, Digital skills, SPSS

Introduction:

Gilgit-Baltistan, a region tucked away in the northwest of Pakistan, is home to stunning natural beauty, the underdeveloped state of Gilgit-Baltistan's economy, isolation from the outside world, and limited access to modern technologies have long been sources of contention. However, the crucial role that technical innovation may play in encouraging entrepreneurship and accelerating economic development has recently become more widely acknowledged in this region. This in-depth study seeks to understand how technology progress has empowered entrepreneurs and stimulated economic growth in Gilgit-Baltistan (Bibi et al., 2026).

The breathtaking landscape of Gilgit-Baltistan, which features lofty peaks, lush valleys, and a fascinating cultural history, is well known. Though there is a challenging economic climate hidden beneath this natural beauty (Hanif et al., 2023). These issues include a heavily reliant economy on agriculture and remittances from foreign workers, high unemployment rates, and limited access to healthcare and education. Together, these components show how innovative methods for economic development are required in Gilgit-Baltistan.

Gilgit-Baltistan has seen the slow but significant rise of technological innovation as a catalyst for transformation in recent years. The proliferation of digital connectivity, including internet access and mobile phone networks, has revolutionized Gilgit-Baltistan (MUJAHID,2025). Residents can now access information, communicate with the outside world, and participate in online learning and business (Smith et al., 2020).

There is a lot of potential for renewable energy in the region, especially for hydropower. Reducing the region's reliance on fossil fuels and addressing energy shortages, technological advancements in renewable energy solutions have created opportunities for clean and sustainable power generation (Ahmad et al., 2019).

A wider range of customers can now be reached by local businesses and artisans thanks to the growth of e-commerce platforms and online marketplaces. Those who produce traditional handicrafts and agricultural products have benefited most from this (Khan et al., 2021).

In Gilgit-Baltistan, a budding startup ecosystem is emerging with the help of regional businesspeople, governmental programs, and outside groups. According to Hussain et al. (2018), these startups frequently use technology to address regional problems and develop creative solutions (Baig and Kalhoro, 2026).

Innovation in technology has also had an impact on skill development and education in the area. Individuals now possess newfound knowledge and abilities thanks to digital skill training programs and online learning platforms (Akhtar et al., 2020).

The combination of these elements, along with the rapid advancement of technology, is progressively changing Gilgit-Baltistan's economic environment and opening up new avenues for business ventures and economic expansion.

Technological Innovation's Contribution to Entrepreneurship development

In Gilgit-Baltistan, technological innovation acts as a multidimensional catalyst for entrepreneurship, providing a number of avenues for business success. The emergence of digital connectivity and e-

commerce platforms has enabled local businesses to reach a wider audience by accessing national and international markets, thereby decreasing their reliance on a restricted local clientele.

Technological advancements in product design and development, frequently enabled by 3D printing and digital tools, have enabled regional craftspeople to produce distinctive and commercially viable goods. Agricultural practices such as crop monitoring, irrigation management, and weather forecasting have all benefited from technological advancements. Furthermore, food technology solutions have surfaced, aiding farmers in efficiently marketing and preserving their produce.

Digital marketing, travel apps, and online booking platforms have all stimulated the tourism sector in Gilgit-Baltistan. In order to improve the visitor experience, entrepreneurs in the hospitality industry have embraced technology (Baig and Kalhor, 2026).

In addition to addressing the energy crisis, the use of renewable energy sources has opened up new business opportunities for energy-related entrepreneurs, such as those involved in the production and installation of solar panels.

Technology-driven educational programs have reduced unemployment rates and fostered a pool of prospective entrepreneurs by providing the local workforce with relevant skills (Ali and Ahmed, 2025).

The Pakistani government has started programs to encourage technology-driven entrepreneurship in Gilgit-Baltistan in partnership with foreign partners. These programs give aspiring business owners money, coaching, and training (Sultan, 2022).

Digital Skills Adoption in Business

Achieving and maintaining success in the modern business environment now heavily depends on the adoption of digital skills. With technology developing at an unprecedented rate, companies that invest in digital skills can gain a competitive advantage and the capacity to innovate in ever-changing markets (Ullah, & Shah, 2025).

A variety of competencies linked to efficiently utilizing digital tools, platforms, and technologies are included in the category of digital skills. According to Yoo et al. (2020), these abilities are now required for modern business operations and are no longer optional. Adopting digital skills can benefit businesses in a number of important ways.

First of all, digital skills promote innovation and increase competitiveness. Organizations need to change fast in this age of rapidly advancing technology if they want to stay relevant. Employees with digital skills are better equipped to investigate new technologies, which leads to the creation of creative goods, services, and operational plans (Asghar, 2026).

Second, a company's market reach is increased by implementing digital skills. Social media and the internet offer previously unheard-of chances to interact with a worldwide audience. Search engine optimization (SEO), e-commerce platforms, and digital marketing allow companies to draw in and keep clients from all over the world (Smith & Taylor, 2021).

Thirdly, increased productivity and efficiency are a result of having digital skills. Digital tools simplify project management and customer relationship management, among other parts of business operations. When these tools are used effectively, manual labor and repetitive tasks are reduced, freeing up employees' time for higher-value work (Shah, 2024).

In entrepreneurship looking to succeed in the digital era must now embrace digital skills; it is no longer a choice. These competencies enable firms to maintain their competitiveness, connect with more customers, and improve operational effectiveness. Businesses must give the development and integration of digital skills into their workforce top priority if they want to stay innovative and relevant (Ullah, & Shah, 2025).

Challenges of Entrepreneurship

Despite the potential of technological innovation, Gilgit-Baltistan's entrepreneurs face a number of difficulties and obstacles:

A digital divide still exists in the region despite notable advancements in digital connectivity, with remote areas having restricted internet access that prevents them from participating in the digital economy. Insufficient infrastructure, specifically concerning transportation and logistics, persistently hinders the expansion of enterprises in Gilgit-Baltistan. The region's hilly topography creates difficulties for building and upkeep (Shakil et al., 2020).

Getting funding for their businesses is a common challenge for entrepreneurs. There might be a lack of funding for expansion if established financial institutions are reluctant to invest in startups (Khan et al., 2021).

Though it is changing, Gilgit-Baltistan's regulatory landscape can still be difficult for business owners. Innovation must be promoted by streamlining procedures and creating a supportive regulatory environment (Batool et al., 2025).

Despite the opportunities that technology has brought about, the skills gap still needs to be closed. Many would-be business owners lack the technical know-how needed to take full advantage of technology (Akhtar et al., 2020).

As technology and economic activity grow, it is important to safeguard the region's delicate environment (Ahmad et al., 2019).

We will delve deeper into each of these variables as we begin this thorough investigation of how technological innovation promotes entrepreneurship in Gilgit-Baltistan, looking at how they interact to influence the region's economic environment. By doing this, we hope to offer insightful analysis and helpful suggestions that can influence legislation, spur entrepreneurial endeavors, and support the long-term growth of this exceptional area (Shah, 2024).

Problem statement

An era of unparalleled technological advancements has been brought about by the digital revolution, drastically altering economies, societies, and industries across the globe. But in the midst of this change, a serious and enduring issue appears: a noticeable digital skills gap. Even though digital technology is widely used, a significant percentage of people, especially in underdeveloped and marginalized communities, lack the necessary digital skills to use these tools effectively. This disparity not only keeps socioeconomic divides alive but also makes it difficult for individuals to access critical online services, work opportunities, and education (karim et al., 2023).

Furthermore, it poses a major barrier for businesses, governments, and colleges and universities hoping to maximise the advantages of the digital economy and advance equitable development. To fully address this issue in the context of Gilgit Baltistan, research is required on the size of the digital skills gap, its

underlying causes, as well as potential remedies and approaches that can close this gap and ensure that no one is left back in the digital age (Zardari et al.,2023).

Justification of study

The urgent need to address the substantial and ongoing digital skills gap, a problem that has broad ramifications for people, communities, enterprises, and societies in the digital era, serves as the foundation for this study. For marginalized communities in particular, closing the digital skills gap is essential for increasing employability and income potential. We can empower people to access a wider range of career opportunities, contribute to economic growth, and lessen income inequality by giving them the fundamental digital skills they need. In order to build a more inclusive society where all people have equal access to knowledge and resources, this gap must be closed.

Scope of research

The scope covers a inclusive analysis of the digital skills disparity, in order to close this gap, the study will also examine the part that commercial, public, and higher education institutions can play. It will also examine doable strategies and methods for bridging the gap and growing digital literacy (Farooq and Haq,2025). The geographic scope includes developed as well as developing nations regions, ensuring a thorough understanding of the global repercussions caused by the lack of digital abilities (Asghar, 2026).

Objectives

Following are research objectives:

- i. To analyze the consequences of the digital skills on entrepreneur , businesses, and society, particularly in Gilgit region.
- ii. To investigate the magnitude of the digital skills adoption and innovation among diverse populations, including underserved communities.
- iii. To offer recommendations based on research findings to guide initiatives, and actions aimed at reducing the digital skills gap in Gilgit .

Hypotheses

H1: Information technology significantly influences entrepreneurship development in Gilgit Baltistan

H2: Digital skills significantly influence entrepreneurship development in Gilgit Baltistan

H3: Innovation adoption significantly influence entrepreneurship development in Gilgit Baltistan

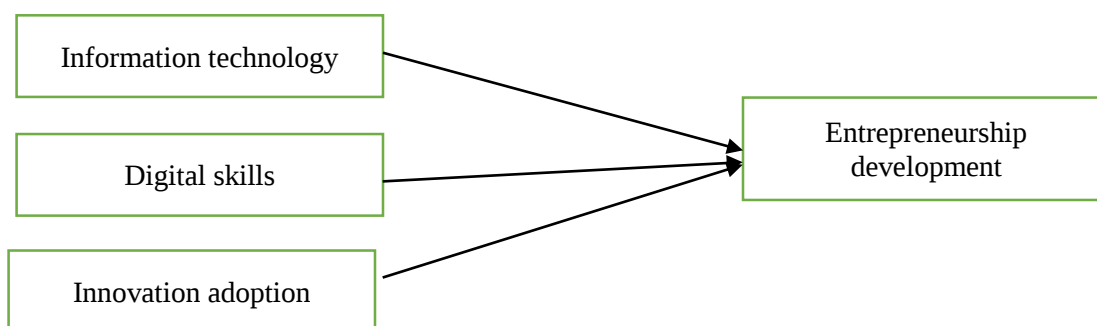


Figure 1 Research Model

Methodology

This methodology outlines the process for determining the sample size using Krejcie and Morgan's table, data collection, and analysis techniques. The study aims to provide insights into the population using the collected data and statistical analyses conducted in SPSS

The study employs the Krejcie and Morgan (1970) table for determining the sample size, considering a population of $N = 1,500,000$. The desired level of confidence is set at 95%, and the margin of error is 0.05 (5%). To calculate the required sample size (n), the formula recommended by Krejcie and Morgan (1970) is utilized:

$$\text{Sample size, } n = N * \frac{\frac{Z^2 * p * (1 - p)}{e^2}}{[N - 1 + \frac{Z^2 * p * (1 - p)}{e^2}]}$$

The calculated sample size (n) is 383 entrepreneurs. The study collects data using a random sampling technique, adhering to the sample size of 383. The sampling process ensures that every individual in the population has an equal chance of being selected.

Data Analysis

Data analysis is conducted using SPSS (Statistical Package for the Social Sciences). The following statistical methods are employed for analyzing the collected data: By descriptive Statistics, Mean and standard deviation are calculated to describe the central tendency and variability of the data. By Inferential Statistics, Correlation analysis is utilized to assess the strength and direction of relationships between variables of interest. Pearson's correlation coefficient is computed to measure the linear association between variables.

Reliability

A crucial component of research and measurement is the evaluation of reliability, which is frequently measured using Cronbach's Alpha coefficients in table 1. A Cronbach's Alpha value of 0.7 or higher is often considered acceptable for most research purposes. If Cronbach's Alpha falls between 0.6 and 0.7, it indicates a moderate level of internal consistency. A Cronbach's Alpha below 0.6 is often considered questionable in terms of internal consistency.

It have assessed the internal consistency of four different variables, including information technology (IT), digital skills, technological innovation, and entrepreneurial development, within the context that has been provided. The Cronbach Alpha values linked to each variable shed light on the level of measurement scale dependability. With a Cronbach Alpha of 0.75, information technology exhibits a moderate level of internal consistency, indicating that the five items within this variable are reasonably coherent. With a Cronbach Alpha of 0.70, the four-item test of digital skills displays a similar level of internal consistency. The three-item variable for technological innovation displays a slightly lower Cronbach Alpha of 0.68, indicating that the scale's internal consistency may have some room for improvement. Contrarily, Entrepreneurship Development has a Cronbach Alpha of 0.78, indicating a moderately high level of internal consistency.

Table 1 *Reliability*

Variables	Items	Cronbach Alpha
Information technology IT	5	0.75
Digital skills	4	0.70
Technological innovation	3	0.68
Entrepreneurship development	3	0.78

Results Analysis

The study aimed to determine role of Technological Innovation in Fostering Entrepreneurship in Gilgit-Baltistan. The study was descriptive and data was collected using a self-developed structured questionnaire. For the statistical analysis of the data, statistical procedures such as mean, standard deviation, Correlation are analyzed. The following is a description of the entire entrepreneurs as participants.

The study aimed to determine role of Technological Innovation in Fostering Entrepreneurship in Gilgit-Baltistan. The study was descriptive and data was collected using a self-developed structured questionnaire. For the statistical analysis of the data, statistical procedures such as mean, standard deviation, Correlation are analyzed. The following is a description of the entire participants in table 2:

Table 2 *Demographic analysis*

Characteristic	Options	Percentage%
Gender	Male	48%
	Female	52%
Age	18-40	73%
	41-50	14%
	51-60	13%
Employment status	Employed	12%
	Unemployed	5%
	Freelancer	38%
	Own business	45%
Total n= 383		100%

In accordance with the information provided in table 2, the research sample's demographics are broken down by gender as shown in figure 2 *Pie chart* , with 48% of participants identifying as men and 52% as women. This suggests a fairly equal distribution of participation by gender, with a little advantage going to women.

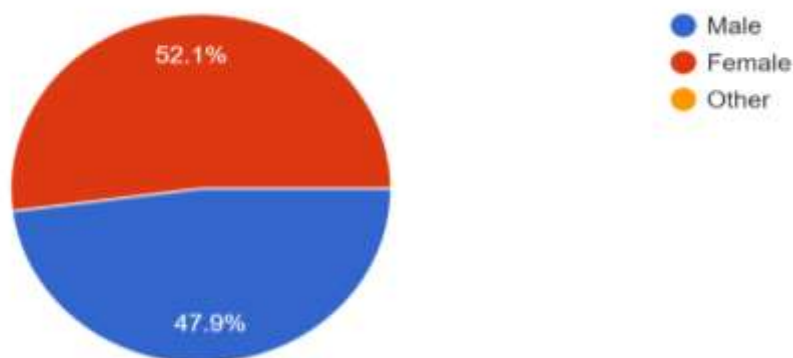
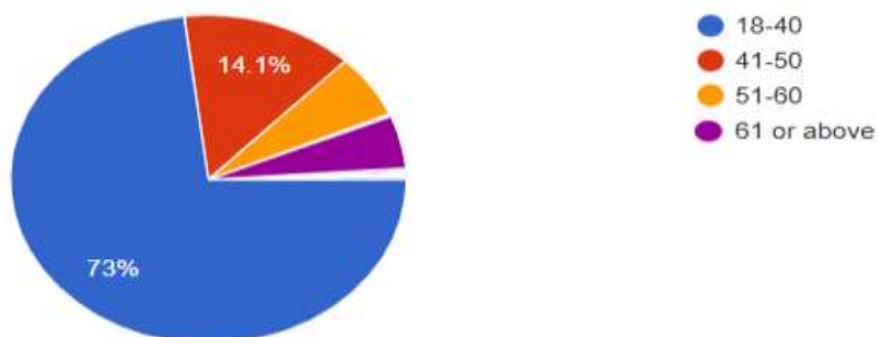


Figure 2 *Pie chart of Gender distribution*

The bulk of participants (73%) are in the 18–40 age range, according to the age distribution shown in figure 3. This shows that younger people make up the majority of the research sample. Participants range in age from 41 to 50 at 14% and 51-above at 13%, respectively.

Figure 3 *Pie chart of Age distribution*



In table 2, Data on participants' employment status reveals a wide range of professional circumstances. Only 12% of participants reported being employed, which suggests that only a tiny minority of the population is now working in a typical job. 5% of participants are unemployed, indicating that there aren't many people doing job or business. A sizable portion (38%), designated as independent contractors. This suggests that a sizable amount of people operate individually or on a project-basis. The 45% of

participants who remained mentioned having their own firms, indicating that there were a sizable number of entrepreneurs in the sample.

Descriptive Analysis

Important perceptions into participant perspectives and experiences are revealed by the statistical data for the variables Inform), Digital Skills, and Technological Innovation. According to table 3 .The responses show a rather wide range in terms of Information Technology (IT), ranging from 3 to 5, suggesting various viewpoints or experiences. The median score of 3.205 indicates that participants generally have favorable opinions or experiences with IT, while there is wide variation (Std. Deviation: 2.1593). The participants generally report having competent digital skills, as seen by the shorter range (2 to 5) and comparatively high mean of 4.64 for digital skills. Since the standard deviation is so little (1.178), the level of self-ation Technology (ITreported talents is more consistently high.

Table 3 Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Information technology IT	383	6	3	5	3.205	2.1593
Digital skills	383	5	2	5	4.64	1.178
Technological innovation	383	7	4	5	4.6	2.89
Valid N (listwise)	383					

The variable Technological Innovation, which has a large range (4 to 5) and a mean of 4.6, indicating modest perceptions of technological innovation, lastly shows significant heterogeneity in perceptions. The large dispersion in participant opinions is indicated by the standard deviation, which is rather high (2.89) in this case. These data provide insightful information on the participants' varied experiences with and opinions about technological advancement, digital skills and IT.

Correlation

It can better grasp the strength and direction of relationships between these variables by these correlations. As mentioned in table 4, there is a significant positive association between these factors ($r = 0.607$, $p < 0.001$). This indicates that there is a greater chance of adopting technological breakthroughs when information technology usage rises, underscoring the mutually beneficial interaction between these two domains in the context of this study.

Table 4 Correlation

		Information technology	Technological innovation	Digital skills	Entrepreneurship development
Information technology	Pearson Correlation	1	.607**	.022	.427**
	Sig. (2-tailed)		.000	.828	.000
	N	383	383	383	383
Technological innovation Adoption	Pearson Correlation	.607**	1	.120	.202*
	Sig. (2-tailed)	.000		.236	.044
	N	383	383	383	383
Digital skills	Pearson Correlation	.022	.120	1	-.082
	Sig. (2-tailed)	.828	.236		.415
	N	383	383	383	383
Entrepreneurship development	Pearson Correlation	.427**	.202*	-.082	1
	Sig. (2-tailed)	.000	.044	.415	
	N	383	383	383	383

There is a noteworthy positive association ($r = 0.427$, $p < 0.001$) between information technology and entrepreneurship. This suggests that, perhaps as a result of technology-driven opportunities, a climate that is more favorable for entrepreneurship is linked to a larger presence of information technology. The two variables have a positive association ($r = 0.202$, $p < 0.05$), although it is not as strong as the other relationships. This implies that acceptance of technical innovation and entrepreneurship are associated, albeit not as strongly as adoption of technological innovation and information technology and entrepreneurship or information technology and information technology. Conversely, there is little evidence of a significant relationship between Digital Skills and the other variables. It shows a weak negative association ($r = -0.082$, $p > 0.05$) with entrepreneurship and a weak positive correlation ($r = 0.120$, $p > 0.05$) with the adoption of technological innovation. These results suggest that information technology may have a greater influence on digital skills in this study when it comes to promoting technological innovation and entrepreneurship. The hypothetical results are mentioned in table 5:

Table 5 Results

HYPOTHESES		RESULTS
H1	Information technology significantly influence entrepreneurship development in Gilgit Baltistan	Accepted
H2	Digital skills significantly influence entrepreneurship development in Gilgit Baltistan	Accepted
H3	Innovation adoption significantly influence entrepreneurship development in Gilgit Baltistan	Accepted

Discussion

The study's research findings provide a wealth of discussion points and shed light on a number of important issues pertaining to the development of digital skills, IT adoption, technological innovation, and entrepreneurship in Gilgit Baltistan. Important information about how these dimensions interact is provided by the correlations that have been found between them.

The first and most important finding is the significant positive correlation between Information Technology and the Adoption of Technological Innovation. This strong correlation implies that the adoption of technological innovations is likely to be driven by a greater emphasis on IT within businesses or professions. This observation, which highlights the transformative power of IT in fostering innovation among Gilgit Baltistan's entrepreneurs, is of utmost significance in the quickly changing technological landscape of today.

Moreover, the positive association found between entrepreneurship and information technology suggests that a significant IT presence could help foster an entrepreneurial climate in Gilgit Baltistan. This study highlights the potential role of IT in promoting entrepreneurial activities by facilitating online networks and business opportunities. This connection is extremely relevant in Gilgit Baltistan, where innovative business ventures and startups depend more and more on digital tools.

Though it is not as strong as the previous correlations, the positive correlation between technological innovation adoption and entrepreneurship is still worth mentioning. It suggests that although there is a relationship between the uptake of innovations and the growth of entrepreneurship, the strength of that relationship may differ based on the particulars of the study setting. This may pave the way for additional research into the surrounding circumstances impacting this correlation.

On the other hand, the comparatively low correlations pertaining to digital skills imply that, within the context of this study (Gilgit Baltistan), digital skills might not have the same impact on innovation or entrepreneurship as information technology. This calls into question the relative weights of these two variables in the context of the research and emphasizes the need for further investigation of the underlying variability.

Conclusion

This study for examining the role of technological innovation in fostering entrepreneurship in Gilgit-Baltistan, determine interrelationships between information technology, technological innovation

adoption, digital skills, as well as entrepreneurship development can be better understood through correlation analysis. It indicates that information technology is crucial in promoting entrepreneurship as well as the adoption of technological innovations, whereas the impact of digital skills seems to be less significant in the context of this research.

We set out to explore the digital skills and their implications in various populations, including marginalized communities, through this extensive research endeavor. Our study's conclusion has produced important results that highlight how crucial it is to close the digital divide and promote digital literacy.

Our examination of a wide range of demographics revealed the complexity of the digital skills gap. Interestingly, there were wide range of opinions and experiences about digital skills, information technology, and technological innovation. Although opinions about information technology were generally quite positive, there was a lot of variation in opinions, which indicates that programs should be specifically designed to accommodate people with varying degrees of comfort and familiarity with technology.

Conversely, there was little variance in the participants' self-reported proficiency, indicating low confidence in their digital skills. This is a positive indication that most participants in Gilgit do not have the necessary abilities to successfully navigate the digital landscape as entrepreneur.

Our research highlighted the dynamic nature of perceptions in the field of technological innovation, with a notable range of opinions. The aforementioned variation highlights the significance of inclusivity in the formulation of innovation strategies and initiatives, as it guarantees the inclusion of both early adopters and more cautious entrepreneurs.

Our research concludes by highlighting the vital importance of closing the digital skills gap, especially in marginalized communities. It can create more innovative digital literacy initiatives and policies that support social justice, economic empowerment, and inclusive growth by taking into account people's varied experiences and viewpoints. Our findings provide a solid basis for well-informed policy development and decision-making in the digital age, guaranteeing that the advantages of technology are felt by all sections of society of Gilgit Baltistan.

Recommendations

Encouraging the development of entrepreneurship in Gilgit while emphasizing digital skills is essential given how quickly the business landscape is changing today. In the digital age, there are a few important suggestions that can be put into practice to empower budding entrepreneurs.

First, especially in underprivileged areas, there ought to be focused efforts to offer training in digital skills that is accessible. To provide people with the requisite technical know-how and digital literacy, this can involve working with educational institutions to organize workshops, online courses, and other initiatives.

Secondly, it is imperative to cultivate an innovative culture. Innovative thinking and creative problem-solving are essential to entrepreneurship. Incubators, mentoring programs, and networking events can all be very successful in fostering innovation.

Thirdly, it is imperative to establish support systems that encompass funding and resource accessibility. Venture capital networks, grants, and financial incentives can assist entrepreneurs in bringing their digital business concepts to life.

Last but not least, it is critical to establish a supportive regulatory framework that includes laws protecting and promoting digital entrepreneurs. This entails cutting bureaucracy, protecting intellectual property, and making sure there is fair competition in the online market. By putting these suggestions into practice, Gilgit regions can enable a new generation of digitally savvy entrepreneurs, spurring economic expansion, innovation, and the creation of jobs in the digital era.

Ethical Considerations

The research strictly adheres to ethical guidelines, ensuring informed consent and the protection of participants' privacy. Confidentiality is maintained in data collection, storage, and analysis. Data is used solely for research purposes and is not shared with unauthorized individuals or entities.

Limitations

The study may face limitations regarding generalizability beyond the sample and potential response bias in the data collection process. The accuracy of the results is contingent on the assumption that the sample is representative of the larger population.

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