

Impact of education digitalization and TIC in promoting social inclusion in universities

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Abstract

This research aims to examine how using digital tools and Technologies, Information, and communication (TIC) in higher education can help advance the goal of social inclusion. This study uses a qualitative and quantitative methodology to help in providing adequate results. The study also conducted descriptive analysis and cluster group effect to determine the relationship between the respondents in this study. This study surveyed 179 undergraduates at Peru's University of Lima and some of the data collected includes age, education level, and gender. As shown in the result, cluster 1 ($\chi^2 = 29.78$; $p = .001$, $\max = 5.1$), Cluster 2 ($\chi^2 = 99.6$; $p = .001$), and Cluster 3 ($\chi^2 = 13.1$; $p = .001$). From the results, incorporating TIC into the classroom can have far-reaching effects on fostering social inclusion in higher education. However,

several factors affect the extent to which digitization promotes social inclusion, such as the quality of the digital infrastructure, the digital competence of students and teachers, and the educational method is taken.

Keywords: Technologies, Information and communication, Digitalization, social inclusion, education.

INTRODUCTION

This article is premised on the idea that policymakers require an immediate response to the impact of Technological Information and communication (TIC) on 21st-century society. According to Salinas & Sanchez (2009), realizing this is a social, economic, cultural, and political demand and a technological one is vital in the trip. The social, economic, cultural, and political underpinnings of society are continually being remade in the fast-evolving "fleeting world" in which we now find ourselves (Mansilla et al., 2022). Today, the so-called globalization of society may be seen in various forms, including the seeming acceleration of time, the reduction of physical space, and the reorganization of social service ties along international lines (Novo-Corti, Varela-Candamio & García-Álvarez, 2014). Conventional frameworks like the nation-state are still vital in society's governance. But, new groups, such as international firms, are increasingly requesting to be considered.

There is widespread agreement amongst academics that the current state of technology has a significant impact on altering the dynamics of society. Knowledge and information creation, management, and use are more important to economic growth and social development than ever. Salinas and Sánchez (2009); Sevillano-Garca & Vázquez-Cano (2015); Palomares-Ruiz et al. (2021); and the advent of the information society are all examples of this. A key accelerator of these new forms of society and economics was the rapid development of new telecommunications and computing technology, particularly in these latter three. The global flows of data, services, and people are essential to the operation of the global knowledge economy, and they are made more accessible by information and communication technology. Everything from online shopping to distance education is made possible by information and communication technologies (ICTs) like the internet and other global telecommunications systems (Daz-Noguera et al., 2022).

BACKGROUND

The role of technology, Information, and communication (TIC) in higher education has improved the standard of instruction, student

engagement, and scholarly investigation. Furthermore, a paradigm shift has occurred due to the development of TIC, altering how students learn. The proliferation of personal computers, the Internet, cell phones, tablets, and other electronic gadgets in the classroom contributed to this shift (Salinas & Sánchez, 2009; Arias et al., 2022). All businesses worldwide are currently adjusting to the fact that "Digital Transformation" (DT) is the primary strategy for economic growth. Ideology, technology, economics, the workplace, and globalization have all contributed to the already convoluted nature of our society.

Changes in pedagogy, study, and administration must be managed, and they are rapidly becoming the norm in today's institutions of higher learning (HE) (Muñoz et al., 2022; Ramos et al., 2022). Technology transfer (DT) is crucial to many countries' economic development and modernization plans. Consequences of Sustainable Development Goal 4 on Higher Education's DT in different regions, countries, and continents; opportunities and challenges presented by Blockchain in the educational context; corporate vulnerability to digital threats; the connection between AI and sustainable development; place of HE within DT's remit; HE's cybersecurity in the context of Industry. Over the past decade, almost every facet of society has been reshaped thanks to technological advancements. (Castillo-Acobo, et al., 2022).

These days, technology is central to many aspects of modern life, including work, school, health, happiness, politics, play, and relaxation, in previously unthinkable ways. Of course, we must exercise caution before declaring that these changes would radically alter our civilization. Often, the innovations that take place "online" merely replicate those that already take place "offline" (Cosmulese et al., 2019). And yet another notable shift has been the increasing decentralization and individualization of life in our interconnected, knowledge-based global society. As a citizen is no longer restricted to the boundaries of his country, town, or family, he must take responsibility for establishing his own life and making his way in the world. Proponents of these shifts argue that they are for the best because they "liberate" societies and their residents from the intrusion of the nation-state and other regulatory organizations, paving the way for a redistribution of services and wealth along more efficient and market-driven lines.

OBJECTIVE OF THE RESEARCH

Open educational resources (OER) have flourished thanks to the widespread use of ICTs in higher education (Daz-Noguera et al., 2022).

Free digital materials created specifically for classroom use and academic study are open educational resources (OER) (Cosmulese et al., 2019). In the context of technology-integrated teaching and learning, OER is a recent phenomenon. But they have already changed how universities worldwide approach education and training their students (Bates, 2015). This is why studying OER appropriation in the context of ICT adoption in higher education makes sense. "appropriation" describes when a person adopts a practice, belief, or object from another culture and uses it as part of their own (Selwyn, Gorard & Williams, 2001). The widespread use of OER can potentially accelerate the development of education and science, particularly in underprivileged areas. Thus, the main aim of this study is to determine policies that are being developed to address this issue: (i) to find out how focusing on education and the use of technology to advance educational equity, and ii) those focused on technology and the use of education to advance technological equity and social inclusion. By examining the societal, economic, and cultural limitations of present-day methods, this research considers several issues of critical importance to developing new technologies and improving educational practices.

LITERATURE REVIEW

The concepts of social inclusion and exclusion have not been thoroughly developed in the literature—most definitions of social inclusion point to its opposite, social exclusion (Rawal, 2008). Participants in any given social activity within a certain organization are said to be "included" (Tomczyk et al., 2019). In social contexts, "social inclusion" can mean either a process that facilitates communication and cooperation among people who differ in critical social ways or it can refer to a deliberate social mechanism that broadens people's opportunities for engagement in all aspects of community life (Silver, 2015; Silverstone & Hirsch, 1992). In contrast, social exclusion is "the process by which people or groups are barred from full participation in the society to which they belong," according to the Oxford English Dictionary (Bawden 2001). In this research, we define appropriation of ICT when using or creating OER in terms of social inclusion and exclusion. ICT can promote and inhibit social inclusion, which inspired this investigation (Tomczyk et al., 2019). Thus, we look at the literature in this area from the perspectives of three main topics: information and communication technology (ICT) infrastructure, the use of open educational resources (OER), and the impact of ICT on access to and success in higher education.

Even if we can't agree on whether early twenty-first-century civilization is better or worse than that of the past, we can confidently

say that it is different. The shifts in society's foundations suggest a wide range of novel activities and modes of operation within a less linear, structured, and predictable logic (Shams et al., 2020). Educators are now expected to tailor their methods of instruction to each student's unique needs. People of all ages and educational backgrounds are expected to portray themselves as lifelong learners who are ready, willing, and able to pursue new knowledge whenever and wherever it may be useful. This may be accomplished by attending school, participating in a distance learning program, or learning at work or in a social context. Some learning opportunities will be individualized for each student, while others will be delivered on a mass scale (Weller, 2014). The traditional idea of "completing one's education" at 16, 18, or 21 is obsolete. The concept of a "career for life" no longer exists, and this shift in schooling reflects that reality (Van Winden, 2001). A person's employability depends on their capacity to adjust to new situations quickly and easily. Workers are expected to be mobile and to be able to report to work whenever and wherever it is needed, rather than simply clocking in and out at a single site from 9 to 5. Flextime, video conferences, and other remote and telework forms are becoming standard in the modern office.

There is a corresponding shift in the range of skills and knowledge considered essential for 'effective' and successful participation in contemporary society because of all these novel activities and 'ways-of-being'. People must be more mobile than ever (Van Heerden & Goosen, 2020; Todorinova & Wilkinson, 2020). Individuals today need to be literate, numerate, and adept in a wide range of information and technology literacies (Bawden 2001). Constant self-evaluation and self-awareness are necessary to successfully navigate the ever-evolving opportunities and available options (Tlili et al., 2021). So, successful person needs to be reflective and self-aware, always analyzing their actions and learning from their mistakes to better respond to new situations. Information and communication technologies (ICT) are widely acknowledged as fundamental to these new ways of being, with pivotal functions supporting such activities as reflexive judgment and social action (Tlili, Ofosu & Zhang, 2021). A wide range of technical options, from mobile phone-based communication to online sharing of knowledge, is likely to be intertwined in the life of the reflexively modern individual. Hence, "no longer about dissociated decision making [now] there is no distance at all between information and action" because of these technologically enabled channels that allow for reflexivity (Sa et al., 2021). Many skills considered crucial in the modern world, such as the ability to communicate, think critically, work in a team, be flexible, etc., are rooted in non-technological practices and environments. ICTs, however, provide a crucial setting for these activities. While

proficiency in information and communication technologies (ICT) is not a prerequisite for surviving in twenty-first-century society, it is almost likely essential to thriving in such a society. Many observers believe this is most relevant when discussing instruction and study.

Because OER is licensed under an open-source model, educators and learners alike can freely use, modify, and share the resources for any purpose (UNESCO, 2002). Open educational resources (OER) are only possible because their creators actively encourage their preservation, reuse, modification, remix, and redistribution (Zhao et al., 2021; Avvisati et al., 2013). Since OER are created, accepted, and communicated via ICT, they are a silver bullet for addressing educational inequality (García-Peñalvo, 2021; Koninari, 2022). So, it may be considered valuable to learn about the difficulties students in the Global South have while trying to access, use, and observe results from open educational resources (OER) (Mossberger Tolbert & McNeal, 2007).

The following reasons have led to an examination of OER use in the Global South. Although the term is widely used, this does not indicate that these resources are being utilized or are increasing. Disappointingly low rates of open educational resource (OER) production, dissemination, and adoption among students, educators, and educational institutions persist (Welch et al., 2014). Using a foreign language in OER instruction is one of the major factors preventing greater participation (Napal, Peñalva-Vélez & Mendióroz, 2018). Other significant factors include a lack of knowledge, awareness, skills, positive attitudes, and internet connectivity (Van Winden, 2001). Considering this reality, universities in underdeveloped nations must devise system-based solutions to foster an environment conducive to producing and disseminating open educational resources (OER).

ICT AND SOCIAL INCLUSION

As OER encompass the delivery of instruction and research in many fields of study, they must be considered in tandem with ICT. Since some educational resources, such as OER, are developed and used via ICT, it is reasonable to consider ICT a useful instrument for fostering social inclusion (Tlili et al., 2021). Collins (2003) defines social inclusion as "the process through which all members of a society can participate in all aspects of that society fully" (Marston & Dee, 2015). For a community to be truly inclusive, everyone within its purview (such as university students) must be afforded the same advantages (Martin & Cobigo, 2011). Regarding gender equality, the economy, politics, and education, ICT is the primary catalyst for social inclusion (Eguavoen, 2016). (HDRO, 2015). That's why it's encouraging to see research suggesting that ICT's use in schools may help broaden participation in

education among historically marginalized groups (Amtallah, 2020). By facilitating the global dissemination of knowledge through open educational resources (OER), ICT contributes to decreasing educational expenditures (Ochieng & Gyasi, 2021). Using information and communication technologies in classrooms is crucial for students' academic success (Chen & Wu, 2020). Additionally, ICT aids educators and students in making well-informed judgments and taking responsible actions to safeguard the educational setting's integrity and sustainability.

Helping to increase the availability of high-caliber, all-encompassing, and life-altering education ultimately improves student achievement (Bonini, 2020). Finally, ICT aids social inclusion by providing sustainable education via e-tutorials, intelligent campuses, MOOCs, blended learning environments (BLEs), technology-enhanced learning (TEL), digital badges, and virtual learning environments. One of the most important determinants of educational equity is access to technology. In 2020, just 53.6% of people worldwide will have access to the internet, according to the International Telecommunication Union, and there will be considerable gaps in the internet penetration rates of rich and developing nations. Factors such as cost, infrastructure, and lack of fundamental digital skills sometimes prevent people in underdeveloped nations from fully accessing technology. Such a situation can widen the gap between rich and poor through the internet. In India, Singh and Thakur (2016) showed a significant gap in the availability of technology in urban and rural areas. They also discovered that children from low-income homes, girls, and children with impairments face additional challenges in the classroom due to a lack of access to technology. The research concluded that the best way to ensure socioeconomic inclusion in education is for governments to improve infrastructure and provide inexpensive technological access.

One way technology integration into the classroom might affect students' lives is through their academic performance. While technology has the potential to expand people's horizons in terms of educational possibilities, it also has the potential to perpetuate existing disparities if not handled responsibly. A school could discriminate against low-income pupils if it mandates using personal electronic devices for online instruction.

According to research conducted in Singapore by Looi, Seow, and Zhang (2014), using mobile devices in the classroom can help promote social inclusion. Students from various socioeconomic situations could access educational resources, cooperate and connect with their teachers and the study's authors because of the widespread availability of mobile devices. Researchers suggested that classroom

activities be created to benefit children of varying socioeconomic statuses.

Classroom inclusion is partly facilitated by students' ability to use digital tools. Using digital tools is crucial for modern life, allowing you to connect with others, share information, and participate in online groups. Yet not all kids can acquire these digital competencies. Researchers Van Deursen and Van Dijk (2014) in the Netherlands identified a close connection between computer literacy and social integration. Students with a high level of digital competence were shown to be more engaged in online learning groups. To guarantee that all children have access to digital resources, the study suggested that schools offer training in digital skills.

MATERIAL AND METHODOLOGY

In this study, we used mixed approaches to incorporate both quantitative and qualitative to provide vigilance research. For the study of social phenomena, there is widespread agreement on the supplementary nature of integrative research (Del Canto & Silva, 2013). The dynamic and multifaceted nature of the topic, as well as its strategic location at the intersection of diversity and innovation, need this viewpoint.

PARTICIPANTS

The participants in this study were 179 teachers in primary training centers (see table 1 below for the distribution).

Table 1: Participants' Distribution

Participants distribution	Distribution	Percentage
Primary School teachers	125	70%
Degree in Secondary Education	54	30%
Total	179	100%

From a total of 179, 125 of these participants were teachers training to be primary school teachers, representing 70%, and the remaining 30% were degree students training to become secondary school teachers. Regarding gender, 79.2% of the participants were male and only 20.8% were female, representing 37 individuals, as shown in the table below.

Table 2: Gender distribution

Gender	Percentage	Frequency
Male	79.2%	142
Female	20.8%	37
Other	0	

INSTRUMENTS

This study used a questionnaire randomly sent to students studying education in Lima, Peru. The questionnaire comprised 19 questions plus two to gauge the participants' pre- and post-survey estimations of their digital ability. Google Forms was used to collect responses, which were then converted to Lickert scale format for analysis. One additional open-ended question was included to understand further how future educators envisioned the role of technology in promoting diversity and inclusion. Permission to use the data for this analysis was acquired from the participants.

Because they all met the requirements for both word count and topic, all written stories were incorporated into the final analysis. The Information was then analyzed. This third stage involved analyzing the narratives as original documents and then classifying the quotations into four categories related to difficulties in the classroom (Puma et al., 2022). Using inductive content analysis, connections between components could be established.

RESULTS AND DISCUSSION

Analysis of teacher's narrative perspective

With the help of critical discourse analysis, we investigate how preservice educators think about technology's place in the classroom and how it may be used to advance the interests of all students. Examining student accounts reveals challenges in society, education, digital literacy, and teacher preparation. The findings are broken down into these four classes. An illustration of the content analysis's findings, based on the most important categories and their interrelationships (as shown in Figure 1), follows.

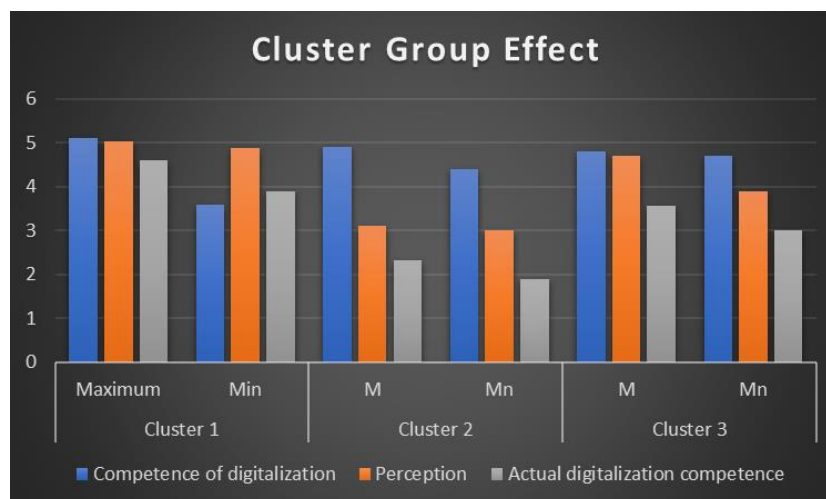
Table 3: Cluster group effect

Variables	Cluster 1		Cluster 2		Cluster 3				
	Maximum	Min	Chi-square	M	Mn	Chi Sqr.	M	Mn	Chi sqr.
Competence of digitalization	5.1	3.6	30.1	4.9	4.4	99.6	4.8	4.7	13.1
Economic factors(cost)	5.5	0.2		4.1	3.9		5.1	4.9	
Societal factor (acceptance)	3.1	0.3	29.78	3.3	0.1	99.6	4.1	0.54	13.1
Perception	5.03	4.89		3.1	3.01		4.7	3.9	
Actual digitalization competence	4.6	3.9		2.32	1.9		3.56	3.01	

Cluster 1 (chi-sqr = 29.78; p .001,max = 5.1), Cluster 2 (chi-sqr.= 99.6; p .001), and Cluster 3 (chi-sqr.= 13.1; p=.001), all exhibited a significant effect of the measure on their initial and final perception and their relation to the Competence of digitalization measure (Table 3). Therefore, in Clusters 1 and 2, the perception drops dramatically from the beginning to the end, with the result being much higher than the Actual Competence of digitalization (Tables 3 and 4). Cluster 3 experienced a substantial decline in perception from the start to finish of the test, indicating an adjustment (same results) between Final perception and Actual Competence of digitalization. Cluster 2 also increased its perception from its initial to the final state, thus widening the gap between its perception and Actual Competence of digitalization.

From the cluster analysis of societal factors, it can be concluded that the use of education digitalization and TIC has a significant impact on promoting social inclusion in universities. The analysis may reveal that the use of digital tools and technology in education can create a more inclusive learning environment by promoting acceptance and diversity among students. The cluster analysis of economic factors, it can be concluded that the cost of education digitalization and TIC can be a barrier to promoting social inclusion in universities. The analysis may reveal that the high cost of digital tools and technology can limit access to education for underprivileged students, who may not have the resources to afford these tools.

Figure 1: Cluster group effect



One study found that Cluster 1 had the most advanced digital skills. Members of this group also rated themselves as the most technically proficient of any group. The majority of the group's participants are middle-aged women, and the majority of the participants were also undergraduates. Because education is a right and inclusion is an undeniable prerequisite in a mature society, ensuring that all students reach their full potential should be the ultimate goal of any educational institution. The viewpoints of preservice teachers are crucial for a complete picture of the situation and the ability to facilitate possibilities from a universal perspective, as inclusion entails more than just a right to attend but also to participate and learn.

Table 4: Cluster comparison

Cluster N	CD vs. Perception	Perception vs. Actual
C1	Z= -2.14 p=0.000	Z= -2.41 p <0.001
C2	Z=-5.16 p<0.001	Z= -5.34 p<0.001
C3	Z= -3.14 p= 0.000	Z= -0.59 p<0.000

Cluster 3 members, despite having the lowest levels of actual digital competence, also had the most realistic levels of perceived competence and the closest correlation to actual competence. There were more women than men in this group (4/5) and they tended to be younger than the average degree-seeking participant (2 out of 3). And clusters 1 and 2 included people with digital competence values that

fell between the first and second categories. Cluster 2 had more realistic perceptions than cluster 3, with much closer perceived competence and actual competence levels; cluster 1 was the only cluster that improved its perception from pre- to post-test. Younger male college students make up most of both groups.

As has been shown in earlier studies by researchers like Van Heerden & Goosen (2020), individuals tend to overestimate their level of digital competence. The necessity to encourage lifelong training programs to build methods for attention to diversity and inclusion mediated by ICTs is also made explicit. These distinctions rely on the various competencies' development areas (Weller, 2014). By doing so, we may help teachers develop their low abilities in this area and spread the word about the benefits of using technology for inclusion in the classroom (Shams et al., 2020). Notwithstanding the promise, profit, audience share, and 'stickiness' remain the primary drivers of commercial development of the technology use most of us are subjected to, rather than issues of ICT-based empowerment, inclusiveness, and public engagement.

While it is true that ICTs have the potential to promote social inclusion and empowerment, observers are often hesitant to recognize that people's actual usage of ICTs is substantially molded and limited by less socially oriented corporate and commercial structures. The casual usage of Microsoft's Instant Messenger program amongst schoolmates by a young person is very different from their immersion in a non-hierarchical and supportive online community (Tlili et al., 2021). A person's right to download a ringtone for their phone is not the same as their right to read the full Communist Manifesto or the complete works of Shakespeare. While academics and commentators may idealize a public-spirited and transformative version of ICT, this view bears little resemblance to the reality of people's commercialized and often mindless usage of ICT.

CONCLUSION

A challenging but potentially crucial factor lies beneath all these other difficulties. Notwithstanding the many proposed solutions, it is important to remember that public sector assistance for individuals' ICT use can only go so far. Considering what we've already discussed about the atomized nature of modern society, any government intervention in the digital divide must assume that the successful individual is reflective and reflexive, building upon and learning from past experiences and reacting to new opportunities and circumstances. In this sense, users must take a reflexive stance toward their ICT use and accept ultimate responsibility for their involvement.

But how can people have the most significant degree of freedom, knowledge, and efficiency when making these decisions using ICT?

Academics, policymakers, technologists, and other stakeholders must create a new dialogue on the digital divide to figure out how to help people make informed decisions and get the help they need to use information and communication technologies (ICTs) effectively (see Cushman and Klecun 2006). Earlier, I stated how the argument for bridging the digital divide might provide consumers with more agency. Reclaiming the discourses surrounding ICTs at the public level is essential to transform their use from a prescribed means to prescribed goals to a collection of tools and practices over which most individuals feel they have some influence and part in molding (Blythe, 2001). However, this is where we need to build the most tangible activities and initiatives.

The impact of technology on students' capacity for active engagement in the classroom manifests itself in various ways. The extent to which a population can access and use digital technologies and has digitally literate citizens been crucial for achieving social inclusion. The widespread availability of educational resources made possible by ICT can increase social inclusion; nevertheless, if not used appropriately, IT can also exacerbate existing inequalities. Governments, educators, and other stakeholders must work together to improve infrastructure, increase access to technology, design learning activities that are inclusive of all students, and offer digital skills training if we want ICT to be utilized to promote social inclusion in education.

The cluster analysis of sociological and economic aspects shows that, while digitalization of education and TIC have the potential to improve social inclusion in universities, the cost of these tools may impede this objective. To ensure that students from all socioeconomic backgrounds have equal access to education digitalization and TIC, governments and educational institutions must take societal and economic aspects into account.

Limitations and Study Recommendations

There is a growing corpus of research on digitalization and TIC's role in advancing campus diversity and inclusion, but this research is not without its caveats. For example, the quality of the digital infrastructure, the digital capabilities of students and teachers, and the pedagogical method employed can all affect the impact of digitalization on social inclusion. Research that only looks at one digitalization facet lacks the complete picture of how technology affects social inclusion. Research examining the long-term effects of digitalization on campus diversity is also necessary. The long-term

effects of technology on social inclusion have often been overlooked in favor of studying its short-term effects.

This study recommends that institutions foster collaborations between educational institutions, government organizations, and private companies to utilize technology better to increase campus diversity. For students from underserved populations to access digital infrastructure and skills training, for instance, partnerships might be formed to give scholarships and bursaries. Consider elements including digital infrastructure, digital skills, pedagogical techniques, and students' socioeconomic background as you investigate the effect of digitalization on social inclusion in higher education. Investigate the effects of digitalization on campus diversity over the long run by conducting longitudinal studies. Access to digital infrastructure and digital skills training for students and faculty members, as well as developing policies and strategies that support such equitable use of technology in universities.

Research Determinants

Determining What to Study First, How to Study It, and What to Study is Determined by How You Choose Your Sample. The sample should be representative of the target population, which in this case is university students. Gender, age, socioeconomic level, and academic performance are just a few of the variables that should be considered while choosing the sample.

Research Design: The methodology used in conducting the study also has a role in deciding the course of action that will be taken in this investigation. A qualitative or quantitative research design, or a hybrid of the two, may be used to conduct the study. The research questions and the variables that will be measured should also be considered during the research design phase.

Data Collection: The third factor is the technique used to acquire the data. Data can be gathered by surveys, interviews, observations, or a mix of these techniques. For the research questions and the research design, the data collection technique should be appropriate.

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