

WhatsApp Usage in the Post Pandemic Era: A Structural Equation Modelling Based Study

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ABSTRACT

Aim of the Study: Communication played a key role during the COVID-19 crisis, but its continued use by employing technology, in the post pandemic era highlights its significance as the preferred social networking tool. This study examined the factors driving students to keep using WhatsApp after the pandemic.

Methodology: Using the user and gratification approach, the researcher conducted a cross-sectional study, collecting data from higher education institutions in Islamabad Pakistan. Structural equation modeling was used for path analysis, along with the Sobel test to examine mediations.

Findings: Data from (n=300) to university students revealed a strong relationship between the post pandemic and increased WhatsApp use. Key factors, such as communication and digital learning significantly influenced this use. Additionally, teamwork and information sharing were found to mediate WhatsApp use among the participants.

Conclusion: The findings suggest that WhatsApp effectively meets students' needs for communication, collaboration, education, and information creating process. Despite the widespread use our words are, these needs and their fulfillment for the solidified the relationship between users and the platform, underlining its significance as a major social networking tool. Study limitations are also discussed accordingly.

Keywords: WhatsApp, Post-pandemic Era, Covid-19, Uses and Gratifications, Pakistan, Structural Equation Modeling.

Introduction

The COVID-19 pandemic presented major challenges for financial and healthcare systems while also disrupting everyday social activities (Elareshi et al., 2022; Roman & Ploeanu, 2021). Today, millions of people are confined to their homes, trying to maintain daily routines while dealing with increased healthcare issues. This crisis has also had a significant impact on education, posing considerable challenges for both teachers and students (Nsabayezu et al., 2020). With the sudden closure of educational institutions and lockdowns worldwide, many schools and universities began seeking alternative methods to continue academic programs. Teacher became increasingly focused on how to the zoom educational activities in the best possible manner. As a result, educational stakeholders and policymakers started exploring new resources to maintain the flow of education. The role of technology particularly

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information communication technology, gained prominence during this time. After my discussion, educational institutions opted for an immediate shift from traditional educational methods (Habes et al., 2021). Consequently, the pandemic played a major role in increasing the adoption of digital learning among students and institutions will stop the integration of ICT into education not only helps sustain academic activities but also led to a rapid increase in the demand for ICT products and services both in schools and at home. Besides, the surge in demand led to significant growth for ICT manufacturers and service providers most of in many countries governments even offered free services to students to ensure their continuation of education (Ali, Qamar, et al., 2021; Habes, Alghizzawi, et al., 2023). Local IT providers were also prompted to improve their technical services in support of government initiatives aimed at creating a digital education pathway. Experts have noted that the pandemic could act as a catalyst for the future expansion of digital learning. In the broader context of global challenges, IT solutions like AI, robotics, 3D printing, and the Internet things are being adopted to build resilience in education and beyond. Even in a post pandemic world, The use of ICT in education remains widespread across both developed and developing nations also web-based applications, such as Skype zoom and WhatsApp and off and tried to education activities. For instance, the institute of pharmaceutical science at the university of veterinary and animal science in Lahore, Pakistan, encouraged students to use these platforms for real time interaction with classmates and instructors. WhatsApp, in particular, has become a preferred tool for communication and learning, allowing students to collaborate and stay linked with their academic environment (Ali, Habes, et al., 2021).

In light of WhatsApp's increasing role for students, this study aims to examine the factors influencing its sustained use in the post pandemic era smoke while different studies have explored WhatsApp adoption during the pandemic, this research focuses specifically on the post pandemic. In Pakistan it seeks to understand both WhatsApp's usability for students and broader technology usage in the country. The study is divided into 6 sections. The first section discusses educational challenges by the pandemic, with a specific focus on Pakistan and the rise of ICT learning. The second challenge explores the role of WhatsApp as a key tool for education. The third section provides an overview of the theoretical framework, while the 4th 1 outlines the research methodology. The fifth section presents the data analysis and results, followed by a discussion of the study findings and theoretical implications in the sixth section.

Literature Review & Hypotheses Development:

WhatsApp- An Overview

Despite physical barriers, WhatsApp enables quick and efficient communication for its users. A study conducted (Susilawati & Supriyatno, 2020) confirmed an increase in WhatsApp usage for sharing information on social, political, and official matters, as well As for staying in touch with family, friends, and classmates. Some users spend long hours on the app, while others exchange just a few messages daily. WhatsApp has proven to be an important tool for students, enhancing accessibility, interaction, and collaboration, even during emergencies (Nsabayezu et al., 2020). Young people especially rely on WhatsApp to stay connected with peers and teachers, keeping them informed about academic proceedings also up at a time when real time socialization and face to face interaction are limited, WhatsApp has become an essential communication tool, supporting relationship at all levels, whether young family, friends, or for educational activities. Its use has even extended to telemedicine, allowing patients to consult with healthcare providers remotely when physical visits are not possible (Al Abiky, 2021).

WhatsApp Usage & Communication

With the increasing number of social networking applications, users typically struggle to choose the most suitable one for their needs. They tend to select an application that caters to communication, information sharing, education, and entertainment. WhatsApp has emerged as one of the most popular platforms, meeting these requirements seamlessly (Budianto & Arifani, 2020). Its strong focus on communication distinguishes it from other social media applications, making it a favorite app for all users. This make it

particularly useful for both personal development and commercial purposes. WhatsApp has become integral to daily life, providing ease of access, constant availability, and usefulness will stop its rising popularity can be attributed to its user friendly interface, adaptable terms and conditions, and frequent updates that ensure smooth and efficient communication process (Ramdhani et al., 2021). As a result, it is widely used not only by mobile users but also by those on computers, creating a sense of connectivity and communication among its users. Studies demonstrated that students in higher education institutions prefer WhatsApp for communication and interactivity. The application's ease of use and perceived usefulness make it an attractive choice for potential user. WhatsApp is known for facilitating the virtual communication, with its text-based chat, voice call, and video call features helping users to communicate clearly and without barriers (Edelhauser & Lupu-Dima, 2020).

WhatsApp Usage & Digital Learning

Mobile applications are now widely used for educational purposes across the globe, offering children's advanced opportunities for online learning for so many institutions have embraced these platforms, providing courses and resources through web-based applications to maximizing accessibility for their students (Enyama et al., 2021). The tool not only facilitate communication and knowledge sharing but also offer affordable learning opportunities. Institutions actively encouraging students to take full benefit of these platforms, including WhatsApp. Notably, WhatsApp has become deeply incorporated into the modern education system. One key advantage of this application is that it functions effectively without wi-fi or broadband offering a affordable solution for students from financially weaker background so this allows user to access real time information, receive guidance from instructors, and stay engaged in their educational journey (Müller et al., 2021). For example, studies show that WhatsApp is widely used by higher education students to access educational materials, communicate with classmates and instructors, and stay informed about academic activities. Students now consider WhatsApp as an essential part of their educational experiences, enriching their learning with greater accessibility and ease of use (Roman & Plopeanu, 2021).

WhatsApp Usage & Teamwork

Two main factors drive the use of social networking today including managing real-world contacts through virtual meetups and accuracy to explore new information. These dynamics have made mobile applications for student education increasingly popular. Students find social media networks, particularly WhatsApp, enjoyable, effective, and easy to use for their educational needs (Budianto & Arifani, 2020). A study several studies further supported a role of WhatsApp and facilitating collaborative learning for students appreciate WhatsApp role in enabling virtual collaboration for their academic work, with many highlighting the significance of smartphones in their educational journey. In such settings, words and not only fosters collaboration but also helps students develop critical thinking skills and give everyone an equal chance to participate this, in turn, improved learning outcomes and increases confidence(Nihayati et al., 2021).

WhatsApp Usage & Information Sharing

WhatsApp is one of the social networking platforms that offer quick access to information for storm known for its user-friendly nature, it facilitates both sharing and receiving information for a minimum cost of \$1.00 per year (Mulyono et al., 2021). As a result, WhatsApp is not only beneficial for the current generation but will continue to serve future generation with its continuous improving features. Information and knowledge sharing have become key activities thanks to the rise of information communication technology, and WhatsApp play a significant role in this process. For example, studies show that students use WhatsApp to stay connected, with professors often choosing a platform for important announcements and sharing information due to its vast capabilities (Maatuk et al., 2022). These studies also witnessed WhatsApp's effectiveness for information sharing. Data from a long-term analysis showed that many users primarily rely on WhatsApp to exchange information, with group messages tending to include more shared content than individual conversations personal students come in

particular, use WhatsApp to improve their communication skills, keeping each other informed about academic issues and institutional activities (Enyama et al., 2021; Nsabayezu et al., 2020).

Uses and Gratifications Theory

Based on this research's basic propositions, problem, and aims, the uses and gratification approach provide theoretical support to current research. The relevant theory is based on the conceptualization of an "active" audience, which further question and validate the role of the audience as actively selecting the media content that is perceived as gratifying their certain needs (Liu, 2015). Consequently, the current research also assumes that the adoption and use of WhatsApp messenger are based on gratifying certain needs to communicate, learn, collaborate, and share information. Notably, (Habes et al., 2022) consider mobiles an effective source of information, education, and communication for students worldwide. As noted, remote devices, particularly smart mobile, provide students with all-in-on places to meet their needs. These needs are the motivation factors that accelerate the adoption process, indicating a clear relevance with the uses and gratifications theory. Notably, the current data indicates that today they are 2 billion WhatsApp users worldwide and in Pakistan, there are 46.5 million users (Data Portal, 2022a). Therefore, in the post pandemic era, WhatsApp has emerged as the third most popular online platform, following Facebook and YouTube. It is now one of the top social networking platforms used by people of various ages, locations, and gender. Originally developed as an alternative to traditional messaging, WhatsApp has successfully fulfilled the communication needs of users globally. During the early stages of COVID-19 pandemic, users collectively spent 15 billion minutes per day on the app, highlighting its broader adoption. However, in the post-pandemic era, this usage remarkably increased, indicating its role in different fields and levels of life (Data Portal, 2022b). Figure 1 graphically represents the conceptual framework of current research:

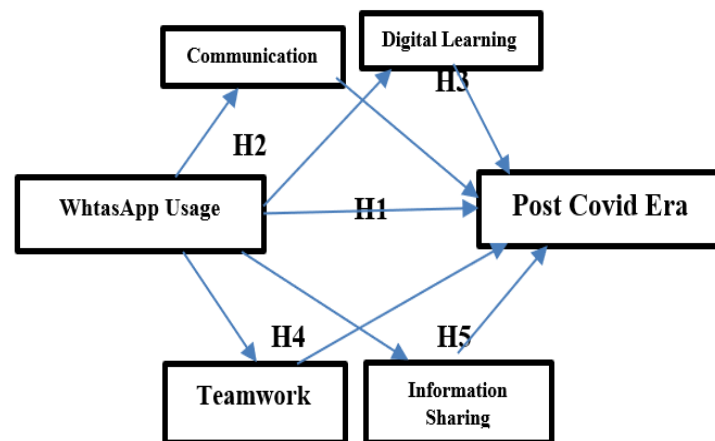


Figure 1: *Explanatory Framework of the Study*

H1: Post Pandemic-19 era positively affects WhatsApp usage among students

H2: Communication positively mediates the relationship between Post Pandemic-19 era and WhatsApp usage among students

H3: Digital learning positively mediates the relationship between Post Pandemic-19 era and WhatsApp usage among students

H4: Teamwork positively mediates the relationship between Post Pandemic-19 era and WhatsApp usage among students

H5: Information sharing positively mediates the relationship between Post Pandemic-19 era and WhatsApp usage among students

Research Methods

Study Design and Instrument

This study used a cross-sectional design to obtain short-term with generalizable results (Gaus, 2017). For the relevant purposes, the researcher used closed-ended survey questionnaires adopted from existing literature (See Table 1). The questionnaire comprised the five-point Likert scale, and the data was gathered from October 2022 to December 2022. The researchers personally visited the selected institutions and distributed the survey questionnaires among the study respondents. In the later process, the researchers coded and entered the data in SPSS and Amos Ver 23 for data analysis.

Table 1: *Sources of Survey Scales and Items*

S/R.	Themes/Constructs	Sources	No of Items
1.	WhatsApp Usage in Post Covid Era	(Khan, 2020; Seufert et al., 2022)	04
2.	WhatsApp's role in Communication	(Nuray ZAN, 2019)	04
3.	WhatsApp usage for Digital Learning	(Barhoumi, 2015)	04
4.	WhatsApp for Teamwork	(Conde et al., 2017)	04
5.	WhatsApp for Information Sharing	(La Hanisi et al., 2018a)	04

Sampling Method

The study population involves students from higher education institutions in the capital of Islamabad. According to the current statistics, there are sixteen universities (both public and private sector) with a total enrolment of 35,197 students at every level. Further, the researcher selected two public sector universities having a total enrolment of 34,071 students. For the sample size selection, the researcher adopted two criterion approach (Barrett, 2007). First, as the study is based on structural equation modelling, Tenenhaus (2008) consider a minimum sample size of $n= 200$ individuals to retain the reliability of the results. The researchers used G*Power analysis. Thus, the relevant approach indicated a minimum sample size of $n= 74$ individuals with one predictor variable suitable for this research. Thus, the selected sample size of $n= 310$ individuals remained ideal. Finally, the researchers randomly selected the study respondents and distributed the survey questionnaires among them. Overall, the response rate remained at 97.4% as $n= 8$ questionnaires needed to be included or considered wrongly filled by the respondents.

Analysis and Results

To confirm the validity of the research instrument and enable the execution of structural equation modelling, the researcher conducted analysis of convergent and discriminant validity (Kennedy et al., 2019).. The assessment of convergent validity included factors such as factor loading, average variance extracted, composite reliability, and Cronbach alpha values, as provided in table one. The Cronbach alpha values fell within the range that indicates reliability, exceeding the acceptable threshold. Composite reliability value is also surpassing accessory benchmark, reinforcing its village to. Besides, the factor loading and AV with the results indicating that both layers exceeded the established minimum, further confirming the presence of convergent validity.

Table 2: *Validity and Reliability Analysis*

Variables	Items	FL	AVE	CA	CR
WhatsApp Usage	WA1	.957	.945	.778	.967
	WA2	.961			
	WA3	.919			
	WA4	.943			
Post Covid Era	PE1	.914	.899	.817	.900
	PE2	.835			
	PE3	.912			
	PE4	.938			
Communication	CM1	.965	.842	.808	.788
	CM2	.958			
	CM3	.711			
	CM4	.734			
Digital Learning	DG1	.955	.858	.720	.799
	DLG2	.782			
	DG3	.827			
	DG4	.868			
Teamwork	TK1	.735	.785	.734	.961
	TK2	.794			
	TK3	.890			
	TK4	.722			
Information Sharing	IG1	.744	.836	.795	.754
	IG2	.759			
	IG3	.909			
	IG4	.933			

Note: WA is WhatsApp Usage, PE is Post Pandemic Era, CM is Communication, DG is Digital Learning, TK is Teamwork, and IH is Information Sharing

Rönkkö and Cho (2022) emphasizes the importance of two criteria, foreigner- larcker and Hetreotrait- Monotrait full confirming the discriminant validity in structural equation modeling studies. The researcher applied both analysis and their work. Levels indicated that the AVE values were higher than the correlation values of other constructs, thus confirming discriminant validity. Besides, the correlation values were further assessed to calculate the HTMT. The computed HTMT value was below the established threshold, further supporting the claim of discriminant validity in current research.

Table 3: *Fornell-Larcker Scale*

	WA	PE	CM	DG	TK	IG
WA	.894					
PE	.034	.895				
CM	.674	.053	.754			
DG	.123	.032	.103	.836		
TK	.085	-.090	.262	.573	.616	
ISG	.408	.006	.492	.013	.386	.698

Note: WA is WhatsApp Usage, PE is Post Pandemic Era, CM is Communication, DG is Digital Learning, TK is Teamwork, and IH is Information Sharing

Table 4: *Heterotrait-Monotrait Ratio Scale (Discriminant Validity Assessment)*

	WA	PE	CM	DG	TK	IG
WA						
PE	.054					
CM	.353	.532				
DG	-.184	.317	.115			
TK	.435	-.030	.212			
IG	.358	.116	.432	.333	.387	

Note: WA is WhatsApp Usage, PE is Post Pandemic Era, CM is Communication, DG is Digital Learning, TK is Teamwork, and IH is Information Sharing

After the gathering process, the researchers conducted one-way ANOVA on the respondents' demographical data. Table 5 shows the test of the relevant test.

Table 5: *Test of Homogeneity of Variances*

Variables	Constructs	Levene Statistics	<i>f</i>	Sign.
Gender	Male	11.928	1.346	.066
	Female			
Age	18-22			
	23-26			
	27-30	8.054	1.568	.073
	31 or above			
Educational Level	Undergraduate	12.555	2.533	.092
	Graduate			
	Post-graduate			
	Diploma			
Locality	Village	6.042	1.565	.638
	City			

The researchers examined predictive power of study model by conducting Coefficients of Determination R^2 . As presented in **Table 6** below, R^2 values range from .783 to .950, affirming our conceptual framework's predictive accuracy. More specifically, researchers found a 95% variance in Communication, 95% variance in Teamwork, 80% in Digital Learning, 86% in Information Sharing, and 78% in Post Covid Era. Overall, all values range above 50% indicating a strong predictive power of the exogenous variable.

Table 6: *Coefficients of Determination R^2*

Variables	R^2 Value
PE	.783
CM	.950
DG	.863
TK	.800
IH	.823

Note: PE is Post Pandemic Era, CM is Communication, DG is Digital Learning, TK is Teamwork, and IH is Information Sharing

Further, path analysis is conducted to examine relationships and study model, which also highlighted regression weights (Valenzuela & Bachmann, 2017). **Table 7** summarizes path analysis indicating path values are significant along with the regression, t-values, and p-values. In this context, it is found that the proposed effect of WhatsApp Usage in the Post Covid Era remained significant with the $t = 17.112$ and a significance level at $p \geq .011$. Further, the researchers tested the mediation effect of Communication on the

relationship between WhatsApp Usage and the Post Covid Era $t = 13.177$ and significance level at $p \geq .000$). Regarding the proposed mediation of Digital learning, results also validated this hypothesis with the $t = 27.256$ and significance level at $p \geq .002$. The researchers proposed and affirmed the mediating effect of Teamwork on the relationship between WhatsApp Usage and the Post Covid Era with the $t = 23.308$ and a significance level of $p \geq .041$. Finally, the mediation of Information Sharing on the relationship between WhatsApp Usage and the Post Covid Era also remained significant with the $t = 19.281$ and a significance value of $p \geq .000$. Overall, the analysis remained supportive, and all the study hypotheses are validated.

Table 7: *Path Analysis, Linear Regression Analysis*

S/R	Hyp	path	t-value	Sign.	Status
H1	WA>CU	.919***	17.112	.011**	Moderately significant
S/R	Hyp	path	Indirect Effects	Sign.	Status
H2	WU>CU>CM	.869***	13.177	.000***	Significant
H3	WU>CU>DG	.178***	27.256	.002**	Significant
H4	WU>CU>TK	-.187***	23.308	.041*	Moderately significant
H5	WU>CU>IG	.731***	19.281	.000***	Significant

Note: WA is WhatsApp Usage, PE is Post Pandemic Era, CM is Communication, DG is Digital Learning, TK is Teamwork, and IH is Information Sharing

Discussion

Social media use has much increased during the past few years. People depend on digital resources to fulfill their entertainment and information needs. However, now that the ICT technology has even improved and integrated, several advantages based on communication and education are undeniable (Mseleku, 2020). Now, users like the content and platforms of their taste to gratify their needs (Nihayati et al., 2021). The results of this study also indicated the significance of these digital platforms, particularly WhatsApp, based on the features/services that facilitate its usage even during the post-pandemic era. Talking specifically about the respondents, we found a great agreement about the role and importance of WhatsApp in their daily life activities. For instance, the first hypothesis of current research focuses on WhatsApp usage during the post-pandemic era. 86.2% of respondents prefer using WhatsApp as the main social networking platform to stay connected with the world. Respondents (83.2%) also revealed that they consider WhatsApp as one of the primary sources of communication, which further leads them (90.2) to feel associated with their family and friends. According to the respondents (87.4%), using WhatsApp in the post-pandemic is equally important when there are certain physical barriers. This usage during the post-pandemic era is consistent with the argumentation by Bdoor and Habes (2024), as noted that selecting a particular social networking platform, i.e., WhatsApp streamlines communication, sharing information, interaction, education is visible after the pandemic is almost over. In this regard, the role, efficacy, and importance of WhatsApp as the major social network is undeniable (Habes et al., 2022)

Regarding the second hypothesis proposing the mediating role of communication in WhatsApp usage during the post-pandemic era, 87.7% of respondents agreed that communication is the leading reason behind WhatsApp usage among them. 84.7% of respondents also revealed that WhatsApp helps them to communicate with their teachers and peers. According to 86.9% of respondents, the role of WhatsApp in communication is comparatively stronger than other social networking applications and websites, as they (89.4%) believe that it provides an easy interaction facility to them. The third study hypothesis was based on investigating the proposed mediation of digital learning on WhatsApp usage during the post-pandemic era. According to 92.4% of respondents, WhatsApp helps them to interact with their instructors regarding academic matters. Respondents (87.8%) also agreed that WhatsApp helps them to stay updated about educational institutions. 87.3% of respondents said their educational institution frequently contacts them through WhatsApp regarding meetings, seminars, and formal proceedings. Finally, 89.3% of respondents

indicated that they rely on WhatsApp as their instructors share course material and Information about study matters. These results are compatible with the argumentation by existing studies (Budianto & Arifani, 2020; Maatuk et al., 2022) as they also examined the role of modern technology in facilitating the learning activities of the students by providing them with a strong medium to resume their education regardless of any potential barriers. Fourth study hypothesis proposed significant mediation of the teamwork on WhatsApp usage during the post-pandemic era. Notably, most respondents (83) agreed that WhatsApp provides a reliable platform to collaborate with their classmates. According to 89.2% of respondents, WhatsApp is important as the groups created help them communicate collectively with their teachers and peers. Respondents also indicated their agreement with the role of WhatsApp in facilitating collective learning, which further led them to prefer group chats and group discussions for a better understanding of the given tasks and assignments.

Finally, the fifth hypothesis examined the mediation of Information Sharing on WhatsApp usage during the post-pandemic era. According to 86.4% of respondents, sharing Information is comparatively easy through WhatsApp, leading them (87.5%) to use it to receive and share information with their contacts. Respondents indicated that information sharing is an interactive feature that helps them to prefer WhatsApp over other social networks. Thus, 90.2 of respondents agreed that Information sharing through WhatsApp is one of the basic determinants that indicates the reasons behind its usage even after the Covid-19 crisis. Thus, the use of mass media has significantly grown during the past few years, with people increasingly relying on media resources to fulfill their information and entertainment needs full staff today, with the rise of information and communication technology, we benefit from various communication and educational opportunities beyond just entertainment and information. Users now actively choose platforms and content that serve their specific needs. Social networking sites have become a popular behavior due to their accessibility and diverse opportunities they offer. Recent studies show that over 1/3 of the global population use social networking platforms daily.

From the users and gratifications perspective, selecting a particular social networking platform, such as WhatsApp, improves communication, education, information sharing, and interaction. The application of this theory to social Media Research has become increasingly significant. A study by Roman and Plopeanu (2021) supports this, as they examine the use of social networking sites in Nigeria using the uses and gratifications approach. Their findings showed their respondents preferred website and Facebook for acquiring information, sharing opinions, and communication. In this context my WhatsApp's role in collaborative learning was highlighted in a study of university students in the UAE, demonstrating its value and socialization, information sharing, learning, and collaborative efforts from my answer 40 by the user and gratification theory of mass media.

Conclusion

This study explored the factors that mediate and enhance WhatsApp usage among the younger generation in the post-pandemic era. As previously mentioned, Covid-19 significantly disrupted daily life, and social networking platforms became essential for maintaining these activities. As a result, the role of social networks has become deeply integrated, continuing to be relevant even in the post-pandemic era. Similar to other countries, Pakistani students use WhatsApp for learning, sharing during information, and communication after the Covid-19 outbreak (Khadija Alhumaid, 2020). These findings emphasize the potential of social media and demonstrate how influential these platforms can be in supporting various aspects of life.

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