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A Comparative Analysis of Students' Technology Uses During Covid-19 Lockdown in Ghana

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Abstract

The study tests an author-derived quantitative version of the Student Technology Use Framework by assessing the effectiveness of distance learning technologies deployed by universities in Ghana during the Covid-19 lockdown period. It focuses on the knowledge acquisition needs of students who were initially admitted into the traditional learning mode but had to adapt to distance learning following the lockdown. The population comprises undergraduate and postgraduate students of the Christian Service University College (CSUC), a private university in Kumasi, and the Ghana Institute of Journalism (GIJ), a public university in Accra. The sample size was 351 - 187 from CSUC and 164 from GIJ. Copies of a questionnaire were distributed to CSUC students by personal contact, and a Google Forms link to GIJ students via e-mail. Results show that students in public universities had lower technological learning capabilities than their compatriots in private universities, resulting in a better learning experience throughout the lockdown.

Keywords: **Student, technology use, knowledge acquisition, distance learning, Ghana**

Introduction

The Covid-19 pandemic has taken center stage in Ghana, giving way to a new normal as people, including scholars and academics, rely on technology to get things done. These technologies have been deployed essentially as an emergency response to avoid disrupting academic work during the Covid-19 lockdown period. This article examines how these technologies have been adopted or adapted in the institutions of higher learning in the country. The result of the investigation is imperative to help take stock as a basis for future decision-making.

Background to the Study

On 11th March 2020, the World Health Organisation (WHO) declared the outbreak of SARS-Cov-2, which causes the Covid-19 a global pandemic. As a result, Ghana's President, on 15th March 2020, suspended all public gatherings. The suspension, which extended to public and private educational institutions, became effective Monday, 16th, until further notice. In addition, he mandated the Ministry of Education to roll out distance learning programs on television.

The announcement caught most institutions of higher learning unawares as they struggled to plot the way forward right in the mid-second semester of the 2019/2020 session. Both public and private universities rolled out emergency responses in distance learning programs, using *WhatsApp*, *Zoom*, *Google Classroom*, and *Moodle* platforms. Students who had hitherto received academic tuition and instructions through the traditional method of face-to-switched overnight into distance learning, encountering some challenges in the process. These distance learning platforms were adopted with little room to train students on their use, though the teaching staff was given some training. The assumption that college students are digital natives (Miller, 2017), owing to their life-long exposure and experience with technology, is possibly the motivation for the sudden switch over. But it remains to be seen if these technologies have served as the process and content gratifications tools.

The students' new experiences from mid-March to the end of May 2020 are significant and worth exploring to inform future decisions. This significance is because, as indicated by Stevens et al. (2018), although the same learning goal drives traditional and distance or independent learning students, the paths for gratifications attainment differ. This viewpoint questions the homogeneity in technology use for

students' knowledge acquisition needs and achievement. This study uses a multi-level approach to investigate the effectiveness of the distance learning technologies deployed by two institutions of higher learning in Ghana during the Covid-19 lockdown period. The study employed a quantitatively adapted version of the Students' Technology Use Hierarchical Framework (Guo et al., 2012) (STUHF) designed by the researchers who tested its application in this study.

Objectives of the Study

The study addresses three main objectives as follows:

i. To assess how students used technology deployed by their institutions of higher learning to meet their knowledge acquisition needs.
ii. To assess the effectiveness of the various technologies integrated or combined to help students acquire their knowledge needs.
iii. To ascertain the extent to which students' expectations to acquire knowledge were gratified through the technologies deployed.

Hypotheses

The study sought to test the following hypothesis through the application of the author-derived quantitative version of the STUHF (Guo et al., 2012):

HI: students in public institutions of higher learning are likely to have better learning capabilities than those of private institutions of higher learning when technology is applied in teaching and learning.

H2: The more e-learning platforms deployed by institutions of higher learning, the more interactive and gratified students will be in acquiring knowledge.

Significance of the Study

This study is significant for some reasons. First, the study has generated a quantitative version of the STUHF (Guo et al., 2012); initially, a qualitative theoretical framework applied to small sample size. This quantitative version is suitable for surveys and thus applicable to larger sample sizes. Secondly, this study assesses the knowledge acquisition gratifications of students admitted initially into the traditional mode but had to adapt to distance learning due to the Covid-19 pandemic. This assessment is a way to take stock of previous activity to accurately ascertain future actions in

terms of technology application in academic work, should the need arise or the Covid-19 pandemic linger on.

Literature Review

Everybody has a need or problem. Any means to achieving a solution gives some amount of satisfaction that passes as gratification. Gratifications, according to Rubin (2009, 167) are "expectations and desires that emanate from, and are constrained by personal traits, social context and interaction." The uses and gratifications (U&G) (Katz et al., 1973) theoretical foundations have over the years been used to explain peoples' motivations for using media and technology.

However, the question of how gratified students will be when they seek out face-to-face knowledge acquisition but get distance learning instead via technology remains unanswered. Newness to distance learning systems can overwhelm and induce anxiety in the students because they are not familiar with the technologies. Most institutions of higher learning in Ghana had to battle with this during the Covid-19 lockdown era when there was a need to continue academic work amidst limited options. As a result, institutions adopted various technological tools for use, such as video conferencing, chat, and audio applications, to convey teaching lessons to students.

Anchoring this situation only on the U&G may not achieve the intended objective. First, U&G assumes that media users are goal-directed in choosing a media type to satisfy their needs. Secondly, users are aware of their needs and select suitable media to gratify their needs (Katz et al., 1974, Yartey et al., 2021, Adesina et al., 2021). In the case presented above, students did not choose the media type deployed by their institutions. They only had to adapt to it as a means to end the semester's activities. Therefore, the STUHF (Guo et al., 2012) shows a better anchor. It presents valuable criteria to assess how gratified students achieved their knowledge acquisition needs using various forms of technology. It accounts for both content acquisition and content gratification variables (Rubin 2009). It also allows gratifications assessment. The term technology operationalizes as any application, whether hardware or software applications, used to store, create, exchange, and use information (Nkosi et al., 2011; Tubaishat et al., 2016).

Students from high school to university have been theorized as 'digital natives (Miller, 2017), largely because of their life-long exposure and experience with technology tools. Some scholars have advocated for substituting teachers with technology tools, claiming that "technology is the language of this

age so undoubtedly it should be used primarily in addressing the young generation who understand it well enough" (Miniawi & Brenjekjy, 2015).

Akin to the stand of Stevens, Guo and Li (2018, 2), Understanding the profiles of different groups of digital natives would assist educators in incorporating technologies in teaching more responsively. Additionally, deploying technology for teaching may not be transformative in itself because it is not an end but rather a means to an end. The transformative ability of a teaching method often adopted largely depends on the content delivered and the process of delivery. Therefore, adopting a technology should be done with the demographics of the students in mind. Students in public institutions of higher learning in Ghana fall within the true digital natives (Miller, 2017) category. Most of them enter the universities immediately after completing senior high school at relatively younger ages and may have explored technology (Banahene et al., 2018). Students in private institutions, however, present a different scenario.

The general opinion is that they are mature (aged 27 years and above). They are admitted into universities years after completing senior high school and are working class (Banahene et al., 2018). Such students may not be technology savvy and may lack the luxury of exploring hi-tech gadgets and technology platforms. Students of this caliber could encounter difficulties when they have to adapt to technology overnight.

The use of technology in education

The use of technology in the context of education has received extensive attention lately, mainly because of the far-reaching use and the perceived advantages it could bring on board (Briz-Ponce et al., 2014; Orgaz et al., 2018; Briz-Ponce et al., 2016; Huang et al., 2007; Weng et al., 2018). Most of these studies measure perception, behavior, and attitudes towards acceptance of technologies in teaching and learning. Only a few recognize how the gratification sought using technology relates to the gratification obtained (Dvoretskaya et al., 2011; Miniawi & Brenjekjy, 2015; Song & Kang, 2012; Zhang & Martinovic, 2008). Like Ghavifekr & Athirah (2015) and Miniawi & Brenjekjy (2015), some of these studies target teachers and institutional managers instead of students. One study found close to this current study is Dvoretskaya et al. (2011).

In a Russian context, they used the survey method in a university to investigate students' expectations and what was achieved in their school's implementation of mobile teaching technologies in their

education system. In seeking what the actual reality gaps were, they found discrepancies between what students expected and the working practices of teachers in using technologies to meet those expectations.

Education thrives on interactions between the environment of the learning community and its members. Guo et al.'s (2012) identification of interaction existing between the *means* (process gratifications) and *ends* (gratifications obtained) attests to this assertion. Moreover, this assertion is provable since interactions dictate whether content gratifications will be achieved or not. Like traditional face-to-face learning, based mainly on interactivity, distance learning communities thrive on interactivity (Wenger, 1998). However, in this instance, it is enabled by technology as a means (process gratification) to achieve interactivity.

Moore (1989) identifies three types of interactions for the success of every academic work: learner-content interaction, learner-instructor interaction, and learner-learner interaction. Learner-content interaction considers how learners engage with the content of the taught subject, resulting in changes in learner's knowledge, understanding, and the cognitive structures of the mind. Learner-instructor interaction deals with the interaction between the learner and the instructor, while learner-learner advances the inter-learner interactions.

The traditional mode of learning in the classroom and campus environment supports all three forms of interaction. They may be difficult to achieve on the distance learning platforms except based on various technology tools and affordances targeted at achieving this goal. The reason is, as argued by U&G enthusiasts, "some media meet certain needs while others fulfill a slightly different configuration of needs" (Sundar & Limperos, 2013, 509-510). The process gratification type, which uses a medium to achieve content gratification (Rubin, 2009), does not always guarantee satisfaction, especially when the technology is not varied. This situation leads to a denied gratification. Palmgreen et al. (1985) aver that gratifications sought from the media may not always guarantee gratifications obtained from them in such a situation.

For traditional mode students, the classroom serves as the place to receive face-to-face information. To transform into distance learning mode students means that, technology takes over the classroom experience. Thus the need for variations and an assortment of technology tools (Sundar & Limperos, 2013, 509-510). Moreover, technology availability, the user-friendliness of the technology, enabled affordances, and

internet service must be reliable to satisfy the sought-after knowledge acquisition.

Theoretical Framework

The STUHF (Guo et al., 2012) underpins this study. Maslow (Maslow 1943) had conceptualized human needs to be hierarchical in nature. Students are not exempt, but the mode of achievement and motivation to use technology to achieve these needs differs and is also hierarchical.

This framework conceptualizes students' technology use motivations as a set of interrelated and hierarchically categorized elements. It draws on the uses and gratifications system of using technologies and the means-end chain approach (Gutman, 1982) for understanding technology use motivations. Combining the U&G theory and the Means-End Chain Approach provides an integrated goal-directed platform for conceptualizing consumer behavior and understanding peoples' motivation and usage behavior of technology (Guo et al., 2012).

The U&G, as a media effect theory, is an audience-centered approach that focuses on what people do with media, as opposed to what media does to people. Thus, its applicability in this study provided a guide to understanding traditional learning students' interaction with technology tools during the Covid-19 lockdown period in Ghana. Arguably, the main reason students used the technologies deployed by their institutions was to acquire knowledge. It also played a big role in assisting students to achieve their learning goals (Guo et al., 2012).

Furthermore, the theory proponents aver that, for students to use technologies and interact well, they must first learn how to use them. Otherwise, they risk achieving a negative technology needs fulfilment. Thus, the three-level hierarchies include the Means or interrelated technology attributes (access and content control, accessibility, communication mode, managing contents, self-disclosure, and course management). These independent technical variables enable students' interaction (consequences), which make up the second level of the hierarchical framework. The final level *ends*, represents the expected goals to be achieved in the learning process after using the technology. These include information seeking, communication efficiency, communication quality, and learning capabilities.

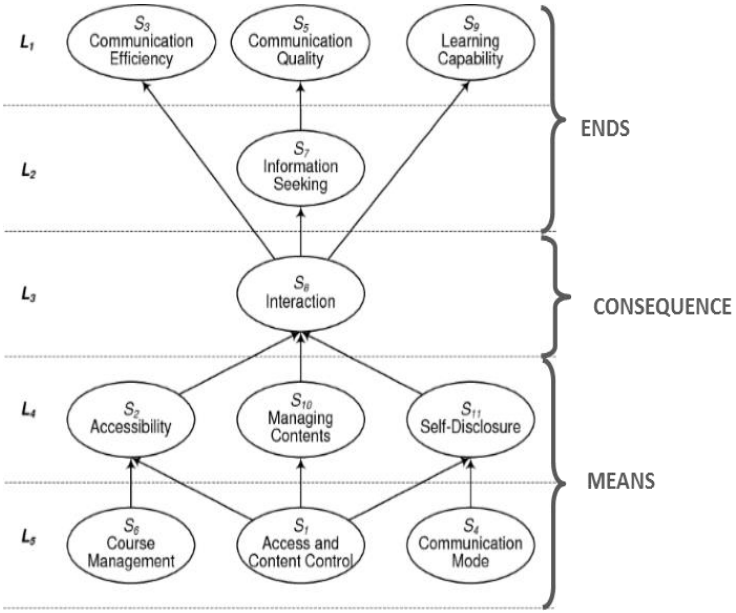

Fig 1: Student Technology Use Hierarchical Framework
Source: Guo, Li & Stevens (2012: 213)

Methodology

Research Method and Measurement of Constructs

This study aimed to explore how beneficial the technologies deployed were to students in gratifying their knowledge acquisition needs. In addition, it tested the applicability of the quantitative version of the STUHF put together by the researchers.

The study adopted a survey method, administering a structured questionnaire to collect data from undergraduate and postgraduate students of the Christian Service University College (CSUC). This institution is a prominent university based in Kumasi, in the Ashanti Region of Ghana. The questionnaire was also distributed in the Ghana

Institute of Journalism (GIJ), a public institution of higher learning based in the Greater Accra Region of Ghana. CSUC has a student population of 1,904, far less than that of GIJ, with 4,259 students.

The Guo et al. (2012) study conceptualized the STUHF from the qualitative standing by interviewing participants. However, this current study opted for a quantitative paradigm to give it a granular effect of increasing the sample size. The study utilized a researcher-developed structured questionnaire version of Guo et al.'s (2012) STUHF. The structured questionnaire of sixty statements and questions had two sections.

The A section comprised 53 phrased statements about using distance learning technologies to acquire knowledge. It also had items on whether or not the knowledge needs and expectations were obtained through the e-learning platforms deployed by their universities. These items align with the means, consequences, and ends hierarchy of the STUHF.

The variables access and content control, accessibility, communication efficiency, communication mode, communication quality, course management, information seeking, interaction, learning capability, managing contents, and self-disclosure served as the basis for statement framing. Each dimension was measured on various items on a seven-point Likert scale. The statements were framed by adapting descriptions on the eleven items in the three-level hierarchy (Guo et al., 2012, 209) and also by using researchers own framed statements. Statements for three items (Access and Content Control, Accessibility, and Communication Efficiency) were based on an adaptation of the questionnaire by Gao et al. (2011). The researchers framed the statements for the remaining eight items. The second part (Part B) of the questionnaire had seven questions to collect respondents' bio data information.

A pilot study was conducted with 30 students who commented on the clarity of questions and suggested modifications based on their understanding. The feedback received was in respect of the number of questions anticipated to translate into a longer time for answering (about 15 minutes). This could not be scaled down owing to the scope of the research and 11-measures within the hierarchy of the framework. The questionnaires were administered by personal contact to students of the CSUC because they visited campus regularly as part of their end-of-semester examinations. This effort provided detailed engagement with

respondents for maximum response rate (Sureshchandar et al., 2002). GIJ students responded to the questionnaire via a Google form link.

Researchers sent weekly reminders to the respondents through their e-mails to enhance engagements throughout questionnaire distribution and completion; between June and July 2020. There were 351 responses in all. Of the 200 questionnaire copies administered in CSUC, there were 187 responses, representing 93.5 percent. There were 164 responses from GIJ on the other hand. However, the response rate was low in this case because the data collection period coincided with the examinations period.

However, it was also an excellent period to assess the effectiveness of the just ended technology-use period. The low response rate notwithstanding, a sample size of 351 is acceptable for studies of this nature (Neuman, 2006). Students engaged in the study were 338 undergraduate students from four 100 to 400 levels of both institutions and 13 postgraduate students from GIJ, studying different programs. This approach ensured maximum variation of samples because of diversity in background, level of study, program or discipline of study, and institution characteristics. The data were analyzed using the SPSS software.

Data Cleaning

The first phase of the data analysis process was to enter the data into SPSS 20.0 and clean up where necessary. The process involved manual entry for CSUC data and then saving Google Forms data of the Ghana Institute of Journalism into Microsoft Excel before exporting to SPSS. All errors were identified in the original data file and corrected by re-visiting the original response sheets for CSUC students and the Excel download from Google Forms for GIJ students. Next, the researchers performed the confirmatory factor analysis (CFA) to purify scales and evaluate internal consistency.

The main justification for using CFA in this study was to test how well the measured variables represent the constructs in the framework. It also helped express the degree of discrepancy between predicted and empirical factor structure and the "goodness of fit" (GOF) of the framework (Prudon, 2015). Finally, it assessed the discriminant validity after problematic indicators had been taken out. Regression and correlation analysis were the main tools used to estimate relationships.

Validity and Reliability Assessment

To evaluate the reliability and validity of the quantitatively adapted

STUHF dimensions, CFA was run and refined using SPSS to show a good fit. After purification, a reliability test was performed for each of the eleven constructs to ascertain whether they measured their stated constructs. Two items were removed from the model because they loaded poorly on their respective factors. The initial four items each, measuring the constructs of Communication Quality (CMQ) and Self Disclosure (SDF), had Cronbach's Alpha values of .526 and .576.

These poor outcomes were due either to poor responding by students or poor loading. By omitting the third item in the Communication Quality construct (Lecturer had to reduce illustrative examples because of limited time) to reduce the number of items to three, the Cronbach's Alpha value improved to .675. For self-disclosure, the fourth item -*I need to portray a different self on the technology to feel accepted* - was deleted. This step reduced the number of items to three and improved the Cronbach's Alpha to .633. Cronbach's Alpha values exceeding .6 cut-off (Hair et al., 2014) were applied in this study. As displayed in Table 1, the estimated reliability coefficients were high, indicating that the adapted scales for the eleven constructs were highly reliable instruments to measure them.

Table 1: Reliability and Validity test using CFA

Measures and items retained		**Factor loadings**	**Cronbach's Alpha**
Access and Content Control	Item 1	.815	.834
	Item 2	.795	
	Item 3	.800	
	Item 4	.812	
	Item 5	.796	
	Item 6	.828	
Accessibility	Item 1	.817	.842
	Item 2	.815	
	Item 3	.810	
	Item 4	.808	
	Item 5	.811	
	Item 6	.854	
	Item 7	.832	
	Item 8	.839	
Communication Efficiency	Item 1	.771	.804
	Item 2	.757	

	Item 3	.737	
	Item 4	.758	
Communication Mode	Item 1	.794	.822
	Item 2	.731	
	Item 3	.766	
	Item 4	.810	
Communication Quality	Item 1	.525	.675
	Item 2	.603	
	Item 3	.607	
Course Management	Item 1	.798	.806
	Item 2	.732	
	Item 3	.757	
	Item 4	.737	
Information Seeking	Item 1	.830	.834
	Item 2	.760	
	Item 3	.804	
	Item 4	.819	
	Item 5	.787	
Interaction	Item 1	.881	.902
	Item 2	.881	
	Item 3	.865	
	Item 4	.873	
	Item 5	.899	
Learning Capability	Item 1	.654	.747
	Item 2	.767	
	Item 3	.638	
	Item 4	.685	
Managing Contents	Item 1	.728	.773
	Item 2	.698	
	Item 3	.782	
	Item 4	.729	
	Item 5	.713	
Self-Disclosure	Item 1	.457	.633
	Item 2	.587	
	Item 3	.555	

Results and Discussions

Demographic Information

For a descriptive summary of students according to the individual institutions, the universities were cross-tabulated with demographic information like ages, the technology deployed by the universities, programs of study, levels, gender, and their work or employment status, as displayed in Table 2. Most of the respondents in the study were females (201), representing 47.3 percent, and 150, representing 42.7 percent were males. Thus, the males were less than the females, contrasting the general university statistics in Ghana, where males outnumbered females (Banahene et al., 2018:144).

Students who offered communication-related programs from both institutions dominated the study (202), representing 57.5 percent because GIJ is a dedicated institution for studying Communications and related programs. CSUC, aside from offering Communications, also had other non-communication studies-related programs like Bachelor of Business Administration, BSc. Nursing, BSc. Computer Science and BSc. Information Technology. CSUC has 38 communication students out of the 202 (18.8%). More 400- Level students – 121- completed the questionnaire, representing 34.8 percent.

Additionally, the mature students who completed the questionnaire from CSUC outnumbered those from GIJ. In this study 60 people, aged 31 and above from CSUC responded to the questionnaire representing 17 percent, compared to 11 in GIJ, representing 3 percent. These figures could represent the students' age distribution in both institutions since private universities in Ghana have more mature students than public universities. Furthermore, more students in CSUC than GIJ were found to work aside from their academic careers. This is the general feeling in the educational environment in Ghana, where more students in private universities than public universities are working alongside schooling. Some 122 students of CSUC, representing 34.8 percent, worked alongside schooling. In contrast, 58 (16.5%) of GIJ students who partook in the survey worked alongside schooling.

Table 2: Demographic information

Item	**CSUC**	**GIJ**	**total**		**Item**	**CSUC**	**GIJ**	**total**
Gender					**Level**			
Male	107	43	**150**		100	40	3	**43**
Female	80	121	**201**		200	57	30	**87**
Total	**187**	**164**	**351**		300	46	41	**87**
					400	44	77	**121**
Programme of study					Postgraduate	0	13	**13**
BBA	64	-	**64**		**Total**	**187**	**164**	**351**
BA Communication Studies	38	148	**186**					
BSc. Nursing	19	-	**19**		**Age Distribution**			
BSc. Physician Assistantship	19	-	**19**		15-20	16	11	**27**
BSc. Information Technology	15	-	**15**		21-30	111	142	**253**
BSc. Computer Science	18	-	**18**		31-40	56	10	**66**
BA Theology	14	-	**14**		41-50	4	1	**5**
Master of Development Communication	-	7	**7**		**Total**	**187**	**164**	**351**

Master of Public Relations	-	3	**3**		**Work and Schooling**			
Master of Public Administration	-	1	**1**		Yes	122	58	**180**
Diploma in Communication	-	5	**5**		No	65	106	**171**
Total			**351**		**Total**	**187**	**164**	**351**

Technology Deployed by Institutions

From the analysis, nine technologies were deployed in total. CSUC used Moodle, Zoom, and WhatsApp, while GIJ deployed Zoom, Moodle, WhatsApp, Google Classroom, Telegram, Youtube, E-Portal, WIX App, and V Class.

Regression Analysis

Two sets of multiple regression analysis were performed to assess the degree of relationship between the criterion variables and predictor variables, the proportion of variance in the criterion variables predicted by regression, and the relative importance of the various criterion variables (Tabachnick & Fidell, 2005, 161) in the three levels of the STUHF.

Regression of Means Variables

The first hierarchical multiple regression used the items within the Means (Course Management, Access and Content Control, Communication Mode, Accessibility, Managing Contents, Self-Disclosure) as predictor variables on the Consequence (Interaction), which was the criterion variable. The predictor variables were also in a hierarchy, thus, the first level predictor variables (Access and Content Control, Course Management, and Communication Mode) served as the first block and the second level

predictor variables (Accessibility, Managing Contents, and Self-Disclosure) served as the second block.

The results in Tables 3, 4, and 5 reveal that the first level of predictor variables - Access and Content Control, Course Management and Communication Mode - predict 38.7 percent (where R = .622 and R^2=.387) of the variance when the other means variables are controlled. This indicates that, aside from other variables, the first three predictor variables contribute to 38.7 percent of students' interaction with the technologies deployed by their various institutions. Upon adding the second block - Accessibility, Managing Contents, and Self-Disclosure - the total contribution to variance by the predictors was 53.1 percent. These figures indicate an R^2 change of 14.4 percent.

This development shows that when the first hierarchy of predictors and all other indicators are controlled, the second block of predictors contributes 14.4 percent to variance. These figures are pretty significant, though not as strong as the first level predictor variables. Therefore, it downgrades the model by reducing the total Fitness of the predictor variables to the model from F=72.88 to F=64.916 (where $F \geq 4$).

Notwithstanding, the predictor variables translated into a significantly Fit model, indicated by the ANOVA result of the six variables where F=64.916, $p = .000^a$, $p = .000^b$. An F-statistic of 4 shows that the model is fit. Therefore, a value of 64.916 indicates that the Means to Consequence model is fit (Table 3).

Table 3: Model summary of hierarchical multiple regression analysis of means variables

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.622[a]	.387	.382	1.22819	.387	72.988	3	347	.000
2	.729[b]	.531	.523	1.07885	.144	35.239	3	344	.000

a. Predictors: (Constant), COMMMODE, ACCANDCONTROL, COURSEMGT

b. Predictors: (Constant), COMMMODE, ACCANDCONTROL, COURSEMGT, SELFDISC, ASSESSIBILITY, MGNCONTENTS

c. Dependent Variable: INTERACTION

Table 4: Analysis of variance of hierarchical multiple regression analysis of means variables

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	330.299	3	110.100	72.988	.000[a]
	Residual	523.436	347	1.508		
	Total	853.735	350			
2	Regression	453.345	6	75.558	64.916	.000[b]
	Residual	400.390	344	1.164		
	Total	853.735	350			

a. Predictors: (Constant), COMMMODE, ACCANDCONTROL, COURSEMGT

b. Predictors: (Constant), COMMMODE, ACCANDCONTROL, COURSEMGT, SELFDISC, ASSESSIBILITY, MGNCONTENTS

c. Dependent Variable: INTERACTION

Table 5: Coefficients of regression of Means and Consequence

Coefficients[a]

Model	Unstandardized Coefficients		St. Coeff..			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	*t*	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	.644	.258		2.491	.013					
ACCANDCONTROL	.086	.055	.075	1.582	.115	.306	.085	.066	.787	1.271
COURSEMGT	.590	.052	.562	11.277	.000	.615	.518	.474	.713	1.403
COMMMODE	.053	.054	.051	.991	.322	.367	.053	.042	.679	1.472
2 (Constant)	-.031	.238		-.130	.897					
ACCANDCONTROL	-.122	.053	-.106	-2.292	.022	.306	-.123	-.085	.643	1.555
COURSEMGT	.291	.055	.277	5.285	.000	.615	.274	.195	.497	2.012
COMMMODE	-.044	.050	-.042	-.875	.382	.367	-.047	-.032	.595	1.681
ASSESSIBILITY	.368	.065	.292	5.640	.000	.559	.291	.208	.509	1.964
MGNCONTENTS	.431	.063	.357	6.852	.000	.644	.347	.253	.502	1.991
SELFDISC	.043	.054	.037	.794	.427	.415	.043	.029	.636	1.572

a. Dependent Variable: INTERACTION

On an individual level, it was possible to assess the contribution of each element within the predictors to the criterion (Consequence or Interaction) of students in using the technologies deployed. The coefficients table (Table 5) shows the first level predictor variables (Access and Content Control; Course Management and Communication Mode). Model 2 combines all six predictor variables against the criterion variable (Consequence). Here, four variables made significant contributions (Sig $\leq$ .05) to the interactions students had on the technologies. In order of statistical significance, Managing Content, Accessibility, Course Management, and Access and Content Control made significant contributions to interactions with Beta values (ignoring negative signs) of .357, .292, .277, and .106, respectively; and *t* values of 6.852, 5.640, 5.285 and -2.292 respectively.

On the other hand, Communication Mode and Self-Disclosure did not make statistically significant contributions to Interaction. They had Beta values of .382 and .427, respectively, with *t* values of -.875 and .794. According to this model and the sample used, the meaning of this is that, in using technology for academic purposes, Access and Content Control, Course Management, Accessibility, and Managing Contents are more important than Self-Disclosure and Communication Mode. The 'self' a person communicates on the technology is of no significance to the information needs of students (Guo et al., 2012). This upshot is so because there are no video affordances on some of the technologies to give visual effects, so personal expression is not essential to students' knowledge acquisition on technology. According to Guo et al. (2012), Communication Mode relates to audibility, multimedia, or visibility on the technology. These specifications are essential depending on the technology being accessed. For technologies like Whatsapp and Moodle, audibility, multimedia, or visibility may not cause any significant impact on the usefulness of the technology.

Regression of Ends (gratification variables)

The second part of the study was to determine the gratifications that students of the two institutions attained in the knowledge acquisition process using the technologies deployed by their institutions. Thus, the Consequence (Interactions) obtained by students was assessed as an indicator of Information Seeking, Communication Efficiency, Communication Quality, and Learning Capability, which together formed the Ends or gratifications obtained in the hierarchical framework.

A hierarchical regression analysis was also carried out. Information Seeking was on a

different level from the remaining three Ends in the STUHF (Guo et al., 2012). It showed up as the first level block of the hierarchy, followed by the remaining three. The regression analysis tables (Tables 6,7,8) show that Information Seeking alone contributed 52.2 percent (R^2 = .522) to the variance of gratifications students sought in using the technologies deployed by their institutions.

This outcome could have emerged because students were mainly seeking the information as part of their knowledge acquisition process. Even though they were initially face-to-face mode students, they did not lose sight that using the technology continued their academic work. The remaining three Ends (Communication Efficiency, Communication Quality, and Learning Capability) contributed 14.5 percent (R^2 change = .145) to the variance of gratifications achieved. Although the variables - Communication Efficiency, Communication Quality, and Learning Capability of the technology contributed to the quality of the information sought, these variables were not as important to students as the information they needed to add to their knowledge.

As shown in Table 6, all the four Ends made statistically significant (Sig $\leq$ .05) contributions to the gratifications achieved by students of the two institutions, with Beta values of (in order of statistical significance) Information Seeking (.337), Learning Capability (.329), Communication Quality (.230) and then Communication Efficiency (.123). It is also evident from the Fitness of the model where the *F* value for Information Seeking alone is *F*=380.837. The remaining three variables in the second hierarchy brought it down to 172.858. Notwithstanding this, the Ends variables translated into a significantly Fit model, indicated by the ANOVA result of the four variables where *F*=172.858, *p* = .000[b]. An *F*-statistic of 4 shows that the model is fit. Therefore, a value of 172.858 indicates that the model of Ends variables to Consequence is fit (Table 7).

Table 6: Model summary of hierarchical multiple regression analysis of Consequence (Interaction) and Ends (gratifications achieved)

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.722[a]	.522	.520	1.08155	.522	380.837	1	349	.000
2	.816[b]	.666	.663	.90716	.145	50.030	3	346	.000

a. Predictors: (Constant), INFOSEEKING

b. Predictors: (Constant), INFOSEEKING, COMMEFFICIENCY, COMMQTY, LEARNCAPA

c. Dependent Variable: INTERACTION

Table 7: Analysis of Variance of hierarchical multiple regression analysis of Consequence (Interaction) and Ends (gratifications achieved)

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	445.488	1	445.488	380.837	.000[a]
	Residual	408.247	349	1.170		
	Total	853.735	350			
2	Regression	569.001	4	142.250	172.858	.000[b]
	Residual	284.734	346	.823		
	Total	853.735	350			

a. Predictors: (Constant), INFOSEEKING

b. Predictors: (Constant), INFOSEEKING, COMMEFFICIENCY, COMMQTY, LEARNCAPA

c. Dependent Variable: INTERACTION

Table 8: Coefficients of regression of Consequence (Interaction) and Ends (gratifications achieved)

Coefficients[a]

Model	Unstd. Coeff.		Std. Coeff.	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	.582	.160		3.636	.000					
INFOSEEKING	.794	.041	.722	19.515	.000	.722	.722	.722	1.000	1.000
2 (Constant)	-.558	.167		-3.338	.001					
INFOSEEKING	.371	.049	.337	7.530	.000	.722	.375	.234	.480	2.082
COMMEFFICIENCY	.149	.043	.123	3.479	.001	.460	.184	.108	.774	1.292
COMMQTY	.286	.050	.230	5.769	.000	.617	.296	.179	.604	1.654
LEARNCAPA	.373	.046	.329	8.076	.000	.682	.398	.251	.582	1.719

a. Dependent Variable:

INTERACTION

The individual contributions of the Ends variables to the gratifications obtained by students were analyzed. As expected, all the Ends (gratifications) variables made statistically significant contributions (Sig $\leq$ .05) to the gratifications that face-to-face students achieved using technology to continue their academic work for the semester. This development implies that indeed the students benefited from the technologies deployed by their institutions. It is evident in the *t* and Beta values of the coefficients table (Table 6) of the Ends variables where Information Seeking, Communication Efficiency, Communication Quality and

Learning Capability contributed *t* and Beta values of 7.530, 337; 3.479, 123; 5.769,.230 and 8.076,.329 respectively.

Correlation

The study further sought to find out the relationship between students' interaction on the technology tools and the variables of the gratification they attained using the various technologies deployed by their institutions separately. Pallant (2002, 130-135) provided a guide. The Pearson correlation to test the relationship between the Ends variables in a bid to access which institution's students had a better learning experience on the technologies deployed by their institutions. For a robust method, correlation statistics should not exceed 0.7 (Hair et al., 2014; Pallant, 2005). The results are displayed in Table 7.

The correlation between all the Ends constructs for the two institutions was positive, with Pearson's Correlation values ranging between 0.3 and 0.7. These figures indicate a moderate relationship between the different variables in students achieving their knowledge acquisition needs. Multicollinearity is not a threat to this analysis. It also implies that students had a good interaction on the e-learning technologies deploying, translating positively with all the Ends gratifications.

This result further confirms that "the greatest affordance of the web for educational use is the profound and multifaceted increase in communication and interaction ability" (Anderson, 2004:42; McLoughlin & Lee, 2007:666). This shows that the technologies deployed by the various institutions were effective in helping students have communication efficiency, communication quality, and thus good learning capability and information-seeking abilities. The implication is that there is a need to continue deploying those technologies if distance learning is to be continued for face-to-face learning students.

Table 9: Correlation matrix

CSUC					
Variables	Info. Seeking	Comm. Efficiency	Comm Quality	Learning Capability	Interaction
Information Seeking	1				
Communication Efficiency	.477**	1			
Communication Quality	.693**	.419**	1		
Learning Capability	.603**	.456**	.376**	1	
Interaction	.757**	.572**	.667**	.668**	1
GIJ					
Information Seeking	1				
Communication Efficiency	.450**	1			
Communication Quality	.530**	.465**	1		
Learning Capability	.634**	.388**	.498**	1	
Interaction	.703**	.429**	.573**	.695**	1

*** Correlation is significant at the 0.01 level (two-tailed)*

From the output in Table 7, the findings for CSUC show that the correlation between Interaction and Information Seeking, Communication Efficiency, Communication Quality, and Learning Capability were .757, .572, .667, and .668, respectively. For GIJ, the output showed that the correlation between Interaction and Information Seeking, Communication Efficiency, Communication Quality, and Learning Capability was .703, .429, .573, and .695. Comparatively, it is evident that the technologies deployed by CSUC and the kind of interaction they enjoyed on it helped them seek information better, have

better communication efficiency, and better communication quality than GIJ students did. On the other hand, the interactions on the technology revealed that GIJ students had a better learning capability than CSUC students.

The above findings support hypothesis 1 (**H1**), while hypothesis 2 **(H2**) is not supported. Though CSUC students were relatively older and most were workers compared to GIJ students, CSUC students had better learning experiences and knowledge acquisition than GIJ students who had better learning capabilities. Though GIJ deployed six more technologies than CSUC, CSUC students had better gratifications from the interactions than GIJ students.

The implications of these findings could be diverse. It could mean that the students of GIJ were not familiar with the interface of most of the technologies deployed and so did not get the best out of them. Though GIJ deployed nine and CSUC deployed three technologies, it could mean that CSUC students were very familiar with their technologies or were easy to access and manage, hence the better experience. CSUC introduces students to Moodle right on admission, and WhatsApp is popular with students. Zoom, being a video conferencing app, has a simple user interface.

It confirms that for students to use technologies and interact well, they must first learn how to use the technologies or risk achieving a negative technology needs fulfilment (Guo et al., 2012). It could also mean that students of GIJ deployed their technology capabilities in other areas apart from teaching and learning. Most of the students of CSUC were workers. They were possibly excited about shuffling less between the workplace and school campus to acquire knowledge. Therefore, they sought to achieve the best technologies to achieve their desired gratifications.

These reasons can, however, not be conclusive. There is a need for a qualitative study to ascertain the higher gratifications for CSUC students further, though the institution deployed a small number of technologies than GIJ.

Discussion: Policy and Managerial Implications

With the realities of Covid-19, higher institutions should not lose sight of the importance of having some of their academic work on virtual platforms. Technology use should be regarded as equally important as the type of interaction to be achieved and, subsequently, the gratifications to be obtained by students. From the

output presented above, the gratifications obtained are dependent on the types of technologies deployed.

Besides that, not all technologies give the same amount of gratification. Other gratifications in knowledge acquisition (e.g., communication efficiency) are equally important as much as information seeking is essential to students. These depend on the type of interaction to be achieved in using the technologies. In deploying technologies for students, the Means to accessing the technology and interactive nature are vital. Therefore, all decisions taken should not be short of these considerations.

Conclusion and Recommendations

The study derived and tested a quantitative version of the STUHF which was originally a qualitative framework by Guo et al (2012). It has been used to test the knowledge acquisition gratification by students who were originally admitted into face-to-face academic work but had to adapt to using technology due to the Covid-19 pandemic. Though the literature review suggested that digital natives (Miller, 2017), as we have in current students are familiar with technological tools and so will have minimal challenges in adapting to technology, the findings of this study have indicated otherwise.

The study recommends training before the adaptation of technological tools to ensure that students achieve the best out of it. Further to this, the researchers recommend that a qualitative study be conducted to ascertain why CSUC students achieved higher gratifications than GIJ students though the institution deployed lower number of technological tools and vice versa.

Finally, the researchers recommend that the framework used in this study should be tested in other contexts to ascertain its applicability in different contexts. Additionally, in the context of CSUC and GIJ, one each of the constructs for the variables Communication Quality and Self-Disclosure was found not to provide a significant contribution, thus their exclusion in the reliability tests. These items were *Lecturer had to reduce explanatory examples because of limited time* for Communication Quality, and *I need to portray a different self on the technology to feel accepted* for Self-Disclosure. A test of the individual items in the various constructs also requires contextual applicability in other areas to ascertain their inclusion or exclusion.

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