



## Master's Thesis

Unplanned Disruptions:  
The Perception of Campus Students to the 100%  
(Involuntary) Use of Information Technology for  
Academic Activities.



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## **Abstract**

In educational institutions, the use of technology has been used to complement face to face learning or used alone to deliver the educational needs and learning process for distance education. Where used alone, it is said to be online learning and where it has complemented traditional learning it can be said to be hybrid or blended learning. Before the pandemic, the question of choice or the voluntary use of these technology was there, and the student determined what was best suited for their educational and learning needs. This study looks at the how the students related with technology during the pandemic. It looks at constructs like performance expectancy, fit for use, effort expectancy, fit for task and ends with investigating the student's perception on intention for future use. Using a mixed approach, the perception of students was sampled. First by using a quantitative method, hinged on the novelty of the disruption to reveal areas that could be of potential interest and then a qualitative method followed. The purpose of using a mixed method approach was for completeness and complimentary reasons. The results of the qualitative data and quantitative data were bridged to form meta-inferences, and these were used to answer the research questions and discuss the findings.

The study revealed that technology was easy to use without little or no technical issues, it was fit for the task at hand, it aided the students to achieve their academic goals and needs, but intention to retain the use of technology for future academic activities was not welcomed. This was due to social factors like lack of motivation, feeling of isolation, lack of social interaction been missing but available in traditional classes. these are critical factors that affect the retention of technology for future use. In the presence of choice, they would rather go back to the traditional mode. They integration of technology with traditional mode of learning, i.e., blended mode of learning was highly welcomed.

## **Key words**

Information technology, perceptions, Campus students, Pandemic, learning, UTAUT, IS Continuance model



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## List of Abbreviations

COVID-19: Coronavirus Disease
LMS: Learning Management System
UTAUT: Unified Theory of Acceptance and Use of Technology
IT: Information Technology
IS: Information Systems
TAM: Technology Acceptance Model



## 1 Introduction

The use of technology in higher education learning has gained significant increase (Grabinski, Kedzior and Krasodomska, 2015). Technology in education now serves to support delivery, enable enhanced learning, and makes collaboration easy. Technology as an alternative channel has made it possible for education to reach a wider audience (Hanif, Jamal and Imran, 2018). Through technology, distance learning has become easy and accessible to students who do not have the luxury of time or to be away from their jobs or family, and to others whose geographical location might be an issue. Technology has made it possible for such students to enroll in academic institutions with the capability of offering courses via digital means thereby breaking geographical barriers (Turney et al., 2009). The freedom to choose how one can be educated has made life easy and this has transformed how education is received and delivered too. Not only has the digital technology served for distance and remote learning, but it has also been used as a tool to support campus learning (Clarke, Nelson and Gallagher, 2020). More recently for flipped or hybrid (blended learning). The presence of technology these days is common in many conventional classrooms (Cherrstrom et al., 2019).

The interruption caused by the Coronavirus disease (COVID-19) presented an opportunity to investigate how technology was used to sustain the learning needs of students, irrespective of their discipline, and to gather their perceptions on the involuntary use of technology to achieve their academic goal. Before the pandemic some students did not have to use or rely solely on technology for academic activities, but things changed suddenly, and they were constrained (without choice) to use technology during the pandemic. As the disruption occurred worldwide, there was an urgent need to salvage academic activities and different teaching methods were adopted based on the alternatives and the realities on ground in all the different academic institutions. For some, it was a difficult situation as they had no alternative to in class learning methods and unfortunately had their educational activities truncated, while for others they had the capability and capacity of technology as an alternative and they migrated to online mode. For the latter category of students, the opinion of such students who before the disruption did not use technology 100% will be examined to see what was done right, how they felt using technology for academic activities, the issues they had, how it was addressed or not, their level of satisfaction towards the use technology for learning, and their perception on the future use of technology for learning. Choice plays an important role towards students desired learning methods (Wang et al., 2019).

Before the pandemic, students freely chose the most suitable learning method or program to enroll for (distance or campus learning), with most students knowing and preparing themselves mentally and physically before the program even started. Digital technology in educational institutions have become the pride of academic institutions Clarke, Nelson and Gallagher (2020), as they now sell this capability to prospective students via webinars conducted online and for virtual campus tours.



Students leave their home countries, go abroad to study in schools they believe will get them access to quality education, be better suited for their skill development, and advance their knowledge. The presence of digital technologies still does not just mean that students will automatically enroll for distance learning programs (organized online), but there are several conditions that affects the students preferred choice of learning (Clarke, Nelson and Gallagher, 2020). So why do students not just take the online learning opportunities? In as much as technology can being used, why do some students choose in class learning and could this new situation lead to a change of mindset?

The use of technology became necessary as COVID-19 led to health agencies putting up recommendations like social distancing (between people) and an enforcement of a certain number of people allowable within an enclosure to prevent the spread of the virus (at least in Sweden where this research was conducted). Some other places had lock downs in place with limited or restricted movement. This research looked at the perception of students, enrolled for on campus (in-class) learning and how they coped as they moved from physical learning modes to online (remote/distance) learning mode. This research is not aimed at determining how best education can be delivered when there is an unplanned disruption necessitating the sole use of technology. Instead, it will gather the opinions of students who largely did not use technology solely as a means for learning before the pandemic. It is important to know that students in Sweden are exposed to technology even in traditional settings no matter how small the use might be. Technology is infused in the form of flipped or blended learning (for example, on-campus students who take joint courses with online students), while others might just use more of traditional methods completely. The outcome of this research will be to add to the existing body of knowledge in areas bothering on the use of technology for academic activities in higher educational institutions either in forced condition or in general, and for courses that using technology did not seem possible.

## 1.1 Background and Problem

COVID-19 was an unplanned disruption that changed the way things were done significantly. January 30, 2020 the Coronavirus Disease (COVID-19) was declared a “public health emergency of international concern” by the Director general of the World Health Organization. This was a newly discovered infectious disease, highly contagious, spreading fast and its modus operandi was not clear. It proved fatal in some cases, some people had symptoms (critical cases led to admissions in intensive care units and others were mild), while others were infected but displayed no symptoms (World Health Organization, 2021). As a result, national health agencies began putting recommendations in place to slow the spread of this virus. In Sweden, precautionary measures in the form of guidelines and recommendations were put in place by Folkhälsomyndigheten (The Public Health Agency of Sweden). This included limiting close contacts with new people except those you live with, maintaining safe distance, avoiding crowded places or spaces, working and studying from home where and when possible (Folkhälsomyndigheten, 2021). These recommendations laid precedence for the recommendations put



in place by higher educational institutions in Sweden. At the end of November, Linnæus University had moved 95% of on-campus teaching and examinations where possible to digital channels, and the remaining activities carried out under strict guidelines (Linnæus University, 2021).

For the campus students enrolled for on-site learning in Sweden, these new recommendations meant a sudden change in the way academic activities were delivered and received. Face to face teaching and educational activities migrated online and involved the use of technological devices. Students had no choice than to adapt quickly to the sole use of technology for learning for the rest of their academic activities. For the distance students who studied online before these disruptions, this was not as issue as they were accustomed to the online mode. For the on-campus students, how then did they cope with this sudden change from having person to person teaching style and contact, to the complete use of technology? For students who learnt with other students within the same settings, what was the new situation like with the use of technology? Some of these students left other countries to Sweden (e.g., the international students), while the others comprise of student's resident in Sweden but in other cities who registered for in-person teaching and had to move to the campus. How was it with the use of technology for learning? For the campus students already accustomed to having in-class learning, what was the situation like for them? Did it turn out to be an eye opener and an opportunity to see the power in technology that could be harnessed for learning or did they have a different experience. The peculiarity of this study is hinged on the fact that this unplanned disruption led to an adoption of technology irrespective of student's preferred choice and the use of technology for learning differs and this can be seen from the way student enroll for learning (Evans, 2013).

## 1.2 Previous work around the problem

There is a growing interest regarding the use of technology in higher education learning. Research surrounding blended learning and flipped classroom in higher education system, to the use of technology for online learning has seen a significant rise. As technology grows, we see its application in making education processes easier by its various application (Turney et al., 2009). The previous works have examined the perception of students regarding the use of this blended learning system or flipped classroom, the use of traditional learning system or just the use of technological artifacts for learning. But most of this research consider technology as a compliment to the in-classroom teaching method where there is still a human moderator, the use of technology alone or the traditional teaching system. The previous work reviewed centered on investigating and understanding the perceptions and the behavior of students undergoing the use of technology to supplement traditional learning (blended learning), and online learning alone (mostly in the case of distance learners) will guide this research.

## 1.3 Gaps in the Knowledge

Numerous research has been conducted around education and the use of technology in higher education. From understudying how to create teaching presence in online courses with videos Banerjee et al., (2020), to using technology to direct learning in higher education Turney et al., (2009),





attitudes of student as a critical factor towards e-learning Jovic, Stankovic and Neskovic (2017), and factors that can lead to learner satisfaction Van Wart, et al., (2020) have been considered and researched. The importance of social interaction and student engagement on drop out ratio of students registered for online learning Wang et al., (2019), to how prior knowledge reflects on the attitudes, behavior and learning performance of students studying via digital technologies Li, (2019) has seen considerable research. Research has constantly been done revolving round the use of digital technology or tools for learning to understand the effectiveness or the benefits for learners, teachers, and faculty members (Evans, 2013). These research, mostly centered around getting the perceptions of students as it relates to what informed their use of technology for blended learning, technology acceptance in education system, predicting performance of students as it relates to the use of different modes of learning (traditional, blended and online). Others looked at the effect of the use of technology on learners' performance, the effect of the ease of use on continuance and factors that determined learners' choice to want to continue using these technologies. This still leaves gaps in areas where learners do not have the luxury of choice and the use of technology is the only means of learning in a system with different kind of learners, based on experience, exposure to technology, background, and most importantly, a major disruption of this magnitude.

#### 1.4 Research Purpose and Research Questions

This research aims to get insights on how campus students enrolled for in-class learning coped with the involuntary use of technology. Could this disruption have led us to a blessing in disguise situation further revealing the power of web technologies, information, and communications technology, in been able to support and deliver educational activities 100%? What are the success factors from the eyes of the students? What could have made it better or were they altogether satisfied? What did the students have to do to harness the best out of this new system? What were the challenges? How about those who had practical courses (courses that involved practical, workshops and lab work), how did they cope in during this set up. Understanding the perception of the students involved can help the authorities see areas they maybe lacked in delivery or to see areas they performed better. This can show areas that needs to be strengthened and areas the institution performed well. More so, for institutions that struggled or had to shut down, this research can show ways that technology could be used in times like these. The success stories and challenges can be a guide to aid others to adopt technology and show areas they can be challenged and thus avoid them. And this leads to the research questions for this study.

**RQ 1:** What is the perception of the on-campus students to the involuntary use of technology for all academic activities during the pandemic?

**RQ 2:** How have the students supported themselves with the use of technological tools to fulfil their learning needs, and what necessitated the use these tools?



### 1.5 Importance and Significance of the Research

One might argue that before COVID-19, students in Sweden interacted with digital technology to access lectures and other educational resources and what makes this research unique? Pre-COVID, campus students did this voluntarily and as a compliment with the face-to-face learning (traditional learning) still available and accessible. The COVID-19 situation differs, as students had to quickly migrate and adapt to only one mode of learning. Besides the online students, the rest mostly use it in part and as a matter of choice or convenience. The unplanned nature of this disruption and the option of choice as to the mode of learning for the students is worth looking at. Most especially since many reasons can be said to influence the way students choose to study Wang et al., (2019). This study will not measure the success of technology but will try to understand how it helped the students who initially relied in part with technology while majorly studying with teachers moderating their classes, and how they think it was able to help them successfully achieve their learning goals.

Exploring the use of a learning system, where students have no power to influence, and gaining an understanding into their experience and what they think of it leaves room for further studies. The knowledge from this can give us insights into the use of technology when disruptions can occur and dispel fears on its suitability in helping the students achieve their academic goals. It could also lead to knowing if learners will decide to continuously use these tools and make a conscious decision even when they have the luxury of choice to adopt the use of technology for their learning activities and what would have made them come to this decision.

### 1.6 Scope and Limitation

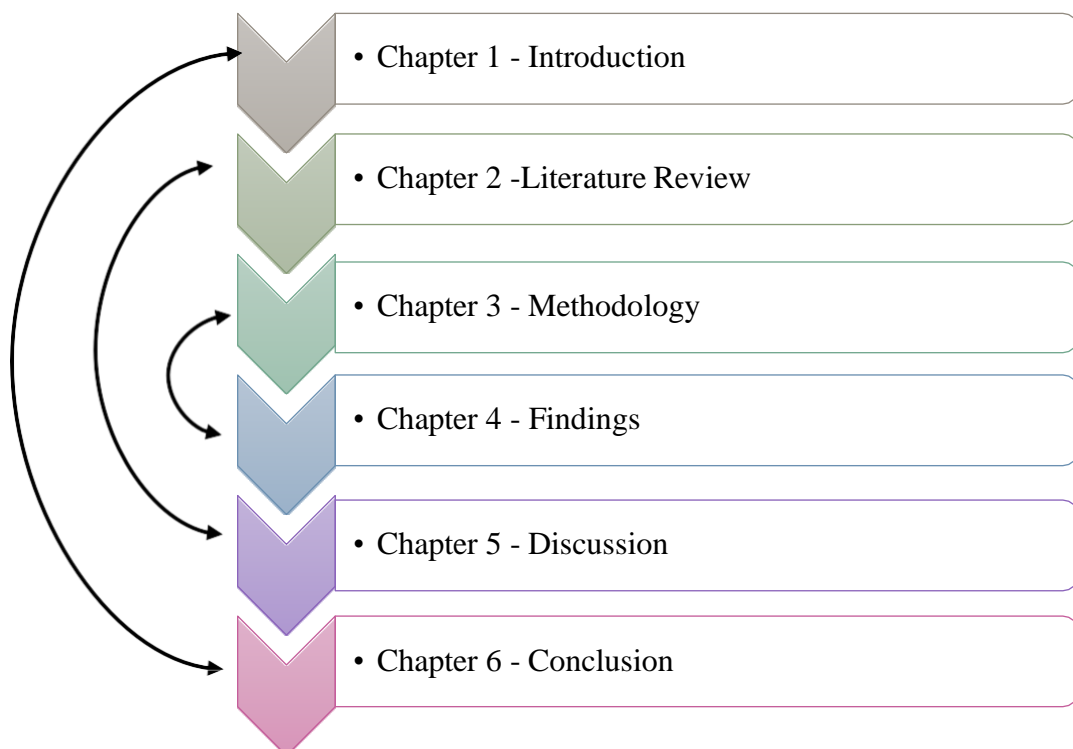
This thesis was aimed at students studying in Sweden, and since it was conducted during the pandemic, it was somewhat difficult getting students to participate in the research. Several appeals were made online means for the survey and the interview, but the turnout was low, this I believe would have been easier and not the case if one had the opportunity to also meet students in person. Some of what limits this thesis includes not been able to get students over a wide range of disciplines to interview. It would have been beneficial to get more opinions from students who had more of practical and hands on courses, and who participated in workshops. Another limitation was that, due to the low turnout, no generalization could be made, as the result of this study was from a small number of people in a large sample population. This study would have also benefited from gathering the perceptions of students registered for online studies and comparing them with the students constrained to migrate online to make an inferred discussion. And lastly, knowing the situation of things in countries in the global south and comparing it with the Swedish situation would have greatly helped in highlighting the differences from both locations and what can be adopted by either place in the nearest future.

### 1.7 Thesis Structure

This thesis comprises of 6 chapters, this inclusive, which introduces the reader to the background and problem area, the previous work, and the gaps in



knowledge. Then it proceeds to the significance and justification of the study and closes with the scope and the limitation. Chapter 2 includes review of literatures regarding the subject of the study, learning types and the role of technology in learning. Chapter 3 explains how this thesis would be done, the paradigm that will guide this research, the research design, strategy of inquiry and the method of data collection. It continues with how the data collected will be analyzed, how the reliability and validity of the data will be done and concludes with the ethical consideration for the thesis. Chapter 4 presents the findings from the data collected and the analysis of the data will also be seen there. Chapter 5 immediately follows and discussions of the findings from the data gotten and analyzed will be done as it relates to the theoretical lenses used to carry out this study. The thesis ends at Chapter 6 where the conclusion, research challenges, the research contribution (practical and theoretical) and the areas for future research will be suggested. A summary of this disposition can be seen below in **Figure 1**.



**Figure 1.** Structure of the thesis.



## 2 Literature Review

### 2.1 Search Procedure

To start any research, it is important to conduct a review of past literatures related to our topic of interest. A well conducted systematic review can form the basis of our research, show what has been done and the contributions to the body of knowledge, support or guide us in the use of methodologies, theories and concepts and expose areas needing more attention (Levy and Ellis, 2006). The Linnæus University's library search service "OneSearch" which contains journals, conference materials, books, e-books, articles, databases and much more that supports joint search in databases and library catalog (The University Library, 2020) was used to search for literatures. A preliminary search was done using the "unplanned disruptions", "perceptions", "use of tech", "students", and "higher education" in the advanced search of OneSearch, and this was chosen based on the topic of the research. Several results came up which was not so strongly related to the topic of discussion. The search was then extended to specific databases like includes EBSCOhost, IEEE Xplore, and ACM Digital library. Some of the documents gotten were from the European Journal of Information Systems, Information systems Journal, Journal of AIS, Journal of Information Systems, Journal of Information Technology and MIS Quarterly. Based on the initial documents found, and a quick review of the title and abstract, the search was continued by expanding the keywords to include,

- ✓ "University"
- ✓ "ICT or Information technology or communication technology"
- ✓ "Perception or attitudes or opinion"
- ✓ "Blended learning or e-learning or hybrid learning"
- ✓ "Use".

Depending on the database and the advanced settings, the use of the quotation marks was either applied or ignored. For the EBSCOhost, the search string was used directly in the Boolean/phase search mode and keywords connected with the "AND" operator as the phase could also accommodate the "or" operator in the database. The ACM and IEEE Xplore, the keywords were in quotes as keywords, phrases or Boolean expressions and connected with the operators "OR" and "AND". The search filter which formed the basis of the inclusion and exclusion criteria. The inclusion criteria started with language set to only documents available in English, publications in selected IS journals, peer reviewed, open access and full text and date of publication set to 2015 to 2021 (as at the time of writing this research). Conference papers, incomplete or duplicates articles and papers were excluded in the search, and a total of 38 papers were downloaded.

To conclude this process, a closer look at the title and abstracts was conducted, 3 more articles were discovered to have been papers from conferences and they were excluded while relevant articles closely related to the topic were considered. Finally, 35 articles were retained and would be used for this review. A full text review of the literatures retained were further analyzed and led to the review provided in this chapter.



## 2.2 Technology, Modes of Learning and Perception of Students

A general overview of the literatures reviewed showed little presence of literatures that related to unplanned disruptions of this magnitude been witnessed currently that has led to the reliance on the use of digital technology and the absence of choice. As of the time of writing this research the COVID-19 situation was still on and had lingered for more than a year with no indication of when it would be over. Considering the process papers would go through to get peer reviewed, approved and accepted, and the disruption still on, it became a little challenging to pin down papers that could give clear indications regarding students experience and perceptions towards learning via only technological means and the use of digital artifacts in a prolonged and uncertain situation like this. And the search further extended to papers that touched upon Emerging remote learning. The papers used for this study centered on concepts that examined online, blended, or in-class modes of learning. These articles explore or explain perceptions, comparisons, and the effect of the modes of learning on teaching and learning outcomes. It should be noted that the concept of “choice” is very much present in this study and the absence of disruptions of the current magnitude.

The issues and the challenges that higher educational institutions, students and faculties must have faced as education delivery from traditional or hybrid modes of learning migrated to only online mode of learning is yet to be fully studied or understood, till the pandemic is over. Thus, concepts like mode of education delivery, presence, engagement, resource/teaching materials, support, trust were the concepts used by Richardson and North (2020) and said to be common to all education delivery mode in understanding the perception of students and other faculty members when migrating to online learning modes of learning.

### 2.2.1 The Role of Technology in Traditional Learning

Cherrstrom et al., (2019) explored the perception of non-traditional students (referred to as students who had the opportunity to interact with technology while also learning in the traditional setting) who sometimes had to learn to use technology or other educational tools for learning. Traditional learning involves in class learning with a teacher as the moderator and no use of technology involved. It was discovered that the value the students placed on these technological tools determined their perceived outcomes. For their study, participants included students enrolled for technology application courses and teaching courses; and they isolated them for the purpose of the study. In the exploration of the effect of traditional spaces on pedagogical effect and learning outcomes, Clarke, Nelson and Gallagher, (2020) looked at the influence of place/location in the delivery of education, this was done to determine its role if it mattered in relation to the learning outcome of students. Higher educational institutions constantly aim to meet the learning needs of their students and even deliver better experience and opportunities, even though in cases like this, the exposure of the students to technological tools can really determine the outcome of learning (Cherrstrom et al., 2019). Cherrstrom et al., (2019) and Clarke, Nelson and Gallagher, (2020) both used qualitative studies to get the perceptions of students on the use of educational



tools to support learning and the role of place (physical location settings) as it determined their learning outcome.

The introduction of technological tools was to make learning flexible Turney et al., (2009) and engaging, the traditional students, were made to use and reflect on technology. The values and potentials from using technology was seen to be immense, while negative consequences identified from the students ranged from inability to disconnect, and the fragmentation of attention (Cherrstrom et al., 2019). Traditional classrooms are also being transformed to enhance student learning experience and pedagogical approaches, even though the central focus of learning is still on instructor-led class sessions (Clarke, Nelson and Gallagher, 2020). To understand the outcome of learning methods Clarke, Nelson and Gallagher (2020), explored the importance of learning spaces. Clarke, Nelson and Gallagher (2020) posited that the physical classroom was said to be important in the facilitating a desirable outcome of student to student, and student to lecturer interaction on learning outcomes. Not only was the classroom important but the design of the classroom mattered if the education was to be perceived as enjoyable, preferred, or rated highly. Clarke, Nelson and Gallagher, (2020) argued that there is more to be known from the study of learning spaces, and more studies are needed to understand the effect of pedagogy, classroom community, perceived learning and actual learning. This study was important because, not only did it look at learning spaces, but it went a step further in differentiating between traditional learning spaces and modern spaces. The modernization of traditional learning spaces would mean that they are still important in education delivery (Clarke, Nelson and Gallagher, 2020).

The non-traditional students in Cherrstrom et al., (2019), discovered that the technological tools made it possible to build informal student communities online. This made connection possible amongst the students, making it easy for them to relate and share ideas. Flexibility due to the ubiquitous and pervasive possibilities that technology brought was another deal breaker, they had the possibility to connect from wherever rather than having to be confined to a particular location. Technology was described by a student as “magic” another felt it could be a “blessing and a curse”. The overall perception of non-traditional students to technology can be likened to what can be said to be “mixed”, even as there were benefits, the students had issues; but not with the quality of the way the technology worked, but issues relating to the “tension” from easy distractions associated with the use of these digital devices or platforms. In addition to the tools provided by the school, the students on their own found other technological tools useful for their learning needs and applied it as it fits (Cherrstrom et al., 2019).

### 2.2.2 Technology for Online Learning (E-learning)

The use of digital artifacts to aid and project teaching materials and videos in online learning formats has been used to mimic what is obtainable with face-to-face learning. With the ongoing pandemic, there has been a growing reliance in the use of technologically based teaching methods, to promote social, cognitive, and teaching presence in the online classroom settings (Banerjee et al., 2020). Li (2019) opines that prior knowledge on how to use digital tools and technology reflects on the attitudes, behavior and



learning outcome of students who engage in video viewing or online lectures. The result from Li's research showed that engagement levels for students with prior knowledge and those without it was the same. But for those with prior knowledge, they had better attitudes and learning performance than those without prior knowledge. The use of videos in online programs varies widely depending on the subject and the instructor. Quality also matters, and the use of videos might not be the same across in all faculty. While some instructors create their video lectures, some have a screen recording of tutorials and others just a form of video feedback (Banerjee et al., 2020).

From my own personal experience this is relatable, online lectures with videos make interaction between teacher and students, and even amongst we the students possible. But in some cases, the face-to-face experience might be missing. Some teachers may choose to use live videos and record their classes for students who want to have the opportunity to revisit the lecture or for other students who missed the class while others may not. In as much as it helps in promoting social, cognitive, and teaching presence Richardson and North, (2020), for a teacher that chooses not to use videos, such an experience might be lost. This can be a challenge for students who misses the class or who needs to go back to the lectures to further understand concepts or what was missed during the class. Most students nowadays do not even like to have their cameras on to depict physical presence when attending online lectures, and this can be challenging or likened to the student watching a movie while the teacher can barely tell if the students present are still there or not except if expressly asked and the students are made to indicate by a gesture or something else. Despite the advantage of video learning styles to support online learning, there is need to understand individual differences too, as this can impose high cognitive loads on some learners which might be difficult for them to handle and can inherently lead to poor learning experience, performance, and perceptions (Li, 2019).

In Richardson and North (2020) a survey of how academic institutions migrated successfully online was done. It was concluded that most of the students and faculty members already had prior exposure to online courses and the use of online methods, and that experience made migrating seamless. Pre-knowledge of how to use these technologies were essential if the use and migration to online mode was to be deemed as successful (Richardson and North, 2020). The need to have some form of online education running already, to whatever degree makes the higher institutions somewhat ready for unplanned disruptions. But to what degree and for a disruption of how long? Prior experience played a vital role in the use of technology for online learning (Richardson and North, 2020).

Jovic, Stankovic and Neskovic (2017), Corlane, Donalds, and Osei-Bryson (2018), and Van Wart, et al., (2020) explored factors that affects students' attitudes towards e-learning; success factors in online learning and factors that lead to students' satisfaction. They all attributed factors that determined student's attitude to e-learning usefulness, ease of use and content design, system or online environmental availability, computer and online learning self-efficacy, the use of online submissions and videoconferencing, student's perceptions of educational integrity and student perceptions of educational integrity. User perception of usefulness and ease of use of these



online modes of learning overlapped in these studies as factors that are important for successful learner engagement via online methods of learning. These success factors do not mean that all is well even as students use online learning modes of learning or that online learning is guaranteed to bring good fortunes. Wang et al., (2019) showed that the dropout ratio in online learning is high and that should be a serious concern as it can be due to low levels of motivation, lack of social interactive engagement which leads to learners feeling lonely, disconnected, and isolated, and social connections with fellow classmates or course mates. The feeling of isolation, student finding it hard to adopt e-learning technologies fully, the feeling of neglect, lack of immediate feedback as would have been gotten from traditional or face to face learning situations, frustration, lack of motivation, the psychological struggle to switch totally from one mode to another were some of the challenges uncovered in the from the studies undertaken by (Barclay, Donald and Osei-Bryson, 2018). Technology has seen a wider application in higher educational institutions, and its adoption has been in different forms. Technology has been exploited to either support teaching like in cases where teaching materials or lecture modules have been uploaded online to support normal teaching with the students having access to it, or technology used completely with every trace of physical contact erased. Although measuring the outcome of the use of technology in these ways has been said to be problematic leading to conflicting views on its adoption and use (Turney et al., 2009). Banerjee *et al.*, (2020) opined that through videos and online teaching modes, student's learning online during a disruption can be sustained and strengthened. The use of videos and online learning for higher education learning differs within courses and subject areas, it can be seamless within management and social sciences, but what happens in technical programs that require laboratory practice, workshops, or even hands on tutorials and practical? The use of technology can be challenging. The prior use of online and digital artifacts for teaching in academic institutions prepares them for unplanned disruptions and makes it easy to migrate totally to the new methods (Banerjee et al., 2020).

Educational institutions have constantly increased investment in technologies that make online learning as a support to variety of courses delivered in traditional learning style possible. The benefits derived can be different amongst institutions and difficult to assess depending on the technological maturity of the institution to put it into use effectively and efficiently, and for how long it has been deployed (Barclay, Donalds and Osei-Bryson, 2018). The characteristics of presence, engagement, resources, support, and trust were said to be constant by Richardson and North, (2020) irrespective of delivery methods and they must be sustained or met. Online teaching methods must strive to fulfil the characteristics of presence which is different from what is obtainable with traditional (face to face) classrooms, engagement with the use of tools that support collaboration among students and instructors (such as social media groups, use of zoom technologies, Microsoft teams), resource availability via the learning management systems, digital library, academic support; support via close monitoring, tracking and constant feedback for the students and their instructors, and lastly trust which is said to be increasing (Richardson and North, 2020).





Online learning does not just promise good things to stakeholders. Its issues and challenges are not exclusive to students alone, instructors were said to have struggled with quality delivery of instructions and the need to learn certain technologies to be able to fit in, more pressure was noticeable for instructors that were new to such system and the burden of streamlining course content to suit online delivery became challenging (Barclay, Donalds and Osei-Bryson, 2018). Choice when selecting a course or program to be taken online are said to be based on students' recommendations, interests and perceived benefits (Evans, 2013). Social media has been said to play an important role. Regarded as herding effect on each other. Students are said to look out for courses they know have been taken by their peers and get their experiences Wang et al., (2019). In other words, when students have the liberty to choose courses to be taken based on delivery mode, they still seek the advice and experience of their peers. This then raises the question again, what happens when this concept of choice or the opportunity to choose is missing and every program, course or lecture must be taken and delivered via only online modes for an indefinite period?

To assure success in using e-learning or online learning modes, three key factors are essential. These are human, content and learning, and institutional factors. The human factors center on the acceptance of the students and faculty members to the complete use of these technological tools and artifacts, the content and learning looks at how the course is designed, and the institutional looks at the organization and the policy surrounding the use of digital technologies and artifacts (Barclay, Donalds and Osei-Bryson, 2018). Barclay, Donalds and Osei-Bryson, (2018) analyzed these factors as key elements any educational institution needs to see in place if they aim to succeed in the use of online teaching. Some of the human factors can be centered around the mindset of the students, how they encourage themselves to utilize these tools, the satisfaction and enjoyment they derive, the feedback they are able to get from teachers and instructors. Institutional factors can be the support system of the organization in resolving the issues and needs of students and how quick are concerns addressed. The software and the permission required by the students; all these are some of the factors that influence users' attitude that can lead to a successful delivery of education via e-learning modes.

Most of the articles reviewed looked at the perception of student satisfaction from an organizational, content or instructor delivery style. Technology acts as the mediator in online learning situations and thus, it introduces new forms of challenges like how to sustain integrity in academic activities. Van Wart et al., (2020) identified that gap in studies regarding student perception to the use of technology as a mediator for online learning. Rather than the traditional evaluation of students, they explored the practice of online teaching itself. First concern raised was about educational integrity in teaching methods that required grading, submissions, and assessment online. Secondly, are the instructors trained to be able to effectively deliver lectures via technological mediating tools and does this affect the perception of students? These are factors that needs to be looked upon to determine learners' perception or satisfaction on the use of e-learning.



With the proliferation of technology in education institution and the dependence on technology now that no other form of learning can be done effectively, the need for proper monitoring of the students by the teachers or instructors have been stressed. Monitoring students can be difficult in an online learning setting. It cannot be performed in the same manner as obtainable in the face to face or traditional approach, and even blended learning. Technology enabled learning spaces are unique and diverse, it can be conducted anywhere, the devices used can range from artifacts that act as a gateway to other learning spaces or the artifacts can afford direct learning opportunities to the students that need it. Monitoring is essential if students must stay motivated and be engaged in the lectures while not feeling isolated, and it makes getting feedback possible (Munoz-Cristobal et al., 2018). As essential as monitoring can be, it is difficult for teachers to know what the students are doing when lectures are on in online settings. Unfortunately, also, the use of video camera on the part of the students during lessons cannot be enforced and it can be impossible to tell whether the students are even physically present in the class, or the student has wandered away but with online presence set as online. Effective monitoring is dependent on the all the parties making it possible for each other to connect with themselves (visually

### 2.2.3 Technology in Blended Learning

This learning mode employs the use of digital tools to support face to face or traditional learning. Blended learning has gained traction and is now a key element of modern education (Grabinski, Kedzior and Krasodomka, 2015). Blended learning has supported the delivery of lectures and made it possible for students to access lectures and educational materials from anywhere and at any time. It has made education accessible to students in a personalized way. Blended learning makes it possible to switch back and forth from face-to-face learning to online mode of studies or other technologically supported modes of education. This mode of learning has opened research on educational quality, service quality and adoption of E- learning based on student satisfaction with the use of e-learning in the study conducted by (Al-Joodeh, Poursalimi and Lagzian, 2017). Student's satisfaction with the use of technology had a positive effect on their adoption and acceptance of e-learning and this has further enhanced the growth of these technologies in higher educational institutions (Al-Joodeh, Poursalimi and Lagzian, 2017).

Ross (2019) posits that there are still conflicting views on blended learning, while some are in favor (the millennials and post-millennials), some are still dissatisfied with the use of learning management systems or information and communication tools that support face to face learning in academic programs and group communications. Islam, (2014) studied the use of slack for communications as a tool to support traditional learning management systems (LMS). The perceptions on the use of LMS was focused on the students and educators, and there was a need to understand that there was a moderating effect of both roles towards the satisfaction gotten from the use of blended learning which is key determinant to its continued use (Islam, 2014).



Islam, (2014) described LMS as a web-based software with the capability to host education materials, avail the instructors the platform to deliver their lessons, manage academic activities online and give the students the medium to stay connected. The use of LMS to carry out academic activities like submission of assignment, tests and examinations, and the access to course materials are some of the huge benefits LMS brings. This has led to a better perception from the students, even though student attitude towards it can be said to be the most important element that determines how satisfied the students are about the course (Grabinski, Kedzior and Krasodomska 2015).

In the survey conducted by Grabinski, Kedzior and Krasodomska (2015), it was discovered that amongst the participants, over half considered e-learning and traditional learning to be the same as regards difficulty and the positive perceptions of students towards the use of blended learning was increasing. There is growing interaction between technology and learning, such that, they complement each other to achieve educational and service quality while also meeting student's educational needs (Islam, 2014). For student contact, it was discovered that the LMS set up and managed by the school was not enough. This was discovered during a disruption in the northeastern part of United States when a snowstorm disrupted academic activities. Even though the universities were able to use LMS to conduct teaching and sustain communication between the teachers and the students, there was the need for a technological solution that the students can use to support and sustain their collaboration and communication, and this led to the use of a business tool, slack in an academic environment to support learning needs (Ross, 2019). The study showed that students do not rely only on technological devices or artifacts provided by their higher institution, but they also go out to look for other informal means that can make collaboration possible. These tools act as an important compliment to the existing technologies as in the absence of face-to-face communication, there may be the need to fulfill communication needs amongst the students themselves and this can be frequent and open (Ross, 2019).

Blended learning has seen a surge in research as it has proven to be very effective for students learning needs and the presence of technological tools in educational institutions is continuously growing. More discussions and research on how to make it better, and the perceptions of students on the use of blended learning has been done and it was projected that in the nearest future 80 – 90% of courses will see a combination of traditional and e-learning methods (Grabinski, KEdzior and Krasodomska, 2015). This is our current reality and one of the factors that has made the switch to online mode possible.

## 2.2.4 Perceptions of Students Towards Learning Methods

The perception of students towards learning methods in academic institutions have helped stakeholders evaluate the effectiveness and the quality of the methods in place (Evans, 2013). The presence of technology in educational institutions have transformed the way learning is delivered and research is constantly done to try to understand the views of students towards the various learning methods they use. These bother on the benefits, challenges and how they could better serve the users. This research can involve the comparison or a combination of learning methods, while others examining



anyone that might be of interest to them or their problem area. Wright (2017) compared the perceptions of students who studied online and in combination with face-to-face learning and discovered that students valued in-class learning more. It was a qualitative study and employed the use of questionnaires (that had Likert scale) and closed-ended questions to get the meaning students attributed to these learning modes. The introduction of technology in flipped classrooms changes the dynamics of the teaching space and how to design classrooms for students studying computer science in that condition was deemed as important. Student's perceptions were sought for and at the end of that study, it showed that flip classrooms can be effective and efficient, and the students preferred the flipped classroom as they saw it as more student centered (Wang et al., 2019). The perceived outcome from flipped classrooms suggests that students are beginning to favor this mode of learning more, be it for oral and written assignments, the students performed better (Garner and Chan, 2019).

In gauging and predicting student's performance, Hasan *et al.*, (2020) used video learning analytics and data mining to see how students responded to the use of technology for learning. It revealed that student responses could also be subjected to data mining techniques to get insights into performance of the use of technology. In Blau et al., (2017) a comparison of the three learning modes, online, hybrid and face to face, was done via a survey between graduate and undergraduate students. The summary of the student's opinion led to a conclusion that students who preferred online studies were more inclined to recommend hybrid or online studies over classroom learning. Furthermore, it could be seen that institutional commitment and persistence led to perceived outcomes for the students.

Evans (2013) used the feedback gotten from graduate students that had experienced the use of face to face versus online teaching modes, to show that the mode of delivery was an important factor that in registering for any program. Two groups were formed, and they both were subjected to the same teaching instructor, but learning was to be via different teaching methods (online Vs face-to-face). The result was such that, the performance of the students that attended the face-to-face lectures was better. This was attributed to the detail and quality of instruction, and the support received from the instructor during the face-to-face lectures. These for instance, was a reason that gave the face-to-face students an edge over the online students, who believed that they did not get as much encouragement like the students who were under face-to-face conditions, also engagement during the online sessions was poor hence a reduced sense of satisfaction for the online students while those who had the face-to-face method felt more satisfied (Evans, 2013). Is technology only possible for delivery of lectures? The use of technology and online methods for project supervision in Brazil revealed that the students considered the benefits from online methods to be the same with face-to-face even though level of experience was key in arriving at that outcome. For the less experienced students, they preferred face-to-face supervision (the more experienced students refer to students that are used to this style of learning). Even though there always seems to be conflicting views on which is better between online or face-to-face, the outcome of online learning mode is said to be improving and growing to be as "powerful" as the



face-to-face learning methods (dos Santos and Cechinel, 2019). The outcome of this study revealed the possibility of using technology to guide student as they carry out academic activities like student projects (thesis) effectively. Digital research as a practice showed that technology can help achieve research goals. In the exploratory study of Given and Wilson (2018), the humanities scholars wanted more tools that could make working together cohesive, standardized and supportive. It was difficult to break away from the technologies they were used to, and it made collaboration difficult (Given and Wilson, 2018). Online programs were said to be popular with graduate students studying courses that require a form of experience or students working and who still wants to earn a degree (non-fulltime students). The outcome of most of the studies that centered on learning and satisfaction, were said to be inconclusive and thus the link between learning and satisfaction questioned by (Bignoux and Sund, 2018). Bignoux and Sund, (2018) questioned the factors that leads to student satisfaction and argued that they are not the same factors that affects perceived learning, and a differentiation of such factors was done and measured differently using surveys. Students learning outcome was therefore measure differently with standardized tests and perceived benefits measured separately via surveys. This outcome was possible by gathering students' opinion.

One factor was deemed as important and a vital influence on the way students perceive learning via mode of delivery, corporate image (Costa and Pelissari, 2017). Costa and Pelissari (2017) explored how the corporate image of a higher educational institution affects the perceived quality students give to distance learning. Perceived benefits were compared between Private higher educational institutions and public higher educational institutions, and it was seen that student's perception of quality education was reflective in the image and the organizational components. The teaching quality, impressions and the learning process ranked higher in the private educational institutions, and this was said to be due to the generosity of public institutions services which has made students feel the perceived benefits will be lower and quality of deliver less. The need for satisfaction from students from higher educational learning has put pressure on them to deliver using various means. This has led to the flourishing growth of hybrid classrooms.

In a recently published article on student satisfaction during the pandemic, Quispe-Prieto et al., (2021) systematically evaluated the how student's Latin American students coped with migrating to online mode of learning. Empirical data gotten from participants were analyzed based several variables, (a) Well-being, educational resources, and learning experience (b) General satisfaction with virtual classes. These variables were further clustered as (i) satisfaction with support, adaptation (ii) satisfaction with interaction and (iii) satisfaction of study program. It was interesting to note that even as results from this study showed satisfaction, there was need for more research over a higher sample size which will consider also, socio- emotional needs and access to digital resources. It should also be noted that, not all research settings will have the same variables or conditions, but research like this will act as guide that than help steer the course of this research.



The articles reviewed showed and explained how students felt using technology for every kind of studies, the conditions and the role of experience. Students' educational needs and experience with technology was a factor to consider in choosing study methods. Mode of delivery is also key based on their expectations of the course. Some courses are more practical and hands-on, others are not. How do we handle situation like this? The research showed how different results were obtained from different studies and how these studies can answer questions as they all relate to the use of technology in higher education learning. How has it been, what were the factors that made adjusting to only one learning mode possible. Even as the restrictions got extended, and the end of the pandemic seemed not to be near. Most of the other studies also do not arrive at a consensus regarding the perceived use or the learning method that was superior. As some favored online methods, some students favored blended while others still favored face-to-face. These were the perceptions of the students that used these technologies or learning methods. Their informed decisions were hinged on different factors too and ranged from experience and exposure to these tools, and even to recommendations from other students.

The different perceptions and outcomes showed how possible it was to have varying outcomes from different sample size. These students may also be constrained to their perceptions based on their own reality and thus can differ. Since the pandemic is on-going, and has lasted for over a year, then some considerable knowledge can be gotten regarding the use of technology as the only medium of learning and student engagement, and how the students feel using only technology during unplanned disruptions. This research will add to what is known, by gathering and analyzing the opinions of the students who used technology for their entire studies. Just like the other research, the outcome can be different as the conditions are not the same. The perception of the students just like the one seen from the research reviewed can aid educational institutions assess the situation of things from the eyes of the students and lead to an informed decision on programs they never taught could be taught online, and which was possibly delivered effectively online; based on the success rate and student feedback. Ultimately, this will make more programs that can be delivered using technology, available to more students.

Summarily, there is still more to be known regarding the use of technology during this pandemic. Just a handful of articles have looked at the perspectives of information and digital competence pre and post COVID-19. This is not surprising because the ongoing situation is yet to see a definitive end. Sales, Cuevas-Cervero and Gomez-Hernandez (2020), posited that the perspectives of students and faculty before and during lockdown was positive as they recorded an accelerated adaptation of the use of technology. It was noted that the use of technology was not new to students, as it connects their everyday life, but its use as a constant instrument lacks academic backing. Therefore, the discussion and conclusion from this study will be solely based on the perception of students in this study and steps on doing so will be gathered from how other researchers and research gathered perception of users and made informed decisions.



### 2.3 The Role of Theory

Theories can be used to develop the context and structure that will guide a study and shed more light on areas that will lead to the answers to the research questions (Cherrstrom et al., 2019). Theory is vital as it helps researchers get answers to research questions and make meaningful contributions to the body of knowledge. Theory in IS aids in gathering knowledge and connecting in a systematic manner, human and technology (artifact), and the relationship between them as new constructs emerge due to their interaction. Thus, it is important to apply the right theory to any research enquiry based on what we aim to achieve as theory forms a foundation and differentiates our study (Gregor, 2006).

This research aims to be exploratory as it will try to understand the students' perceptions and understanding as they relate with the unavoidable use of technology for educational purposes. Gregor (2006) posits that an exploratory theory helps answer questions like what is, how, why, when, and where; while trying not to predict, prescribe, or describe the situation under focus. From the results of the empirical data gotten, the theory as it fits will be appropriately used. To aid the understanding of student's perceptions, during this mode of learning, one must be conscious of the fact that so many factors or variables will shape their overall assessment, leading to the impressions they will have and consequently their informed experiences. It is not enough to focus on the students alone or the technology or even the lecturers that used these tools. Non-teaching factors like convenience, comfort, level of experience and exposure to technology, learner characteristics and readiness, etc., are some conditions that can make students have a good experience or not from the learning process and they need to be carefully considered. Other factors that can also inform the quality of perception could center around the support the students get in the forms of instructions, teaching presence, online modality (flipped, blended, 100% technology based, etc.), social presence, online social comfort, cognitive presence, and mode of online interaction (Van Wart et al., 2020). The next sections will highlight some research theories and a summary of the theories to consider for this research.

#### 2.3.1 Learner Interaction Theory

Cherrstrom et al., (2019) applied this theory to examine and understand external factors that influenced learners' perception as they used educational technology tools. These are said to be key elements that influenced how students selected technological educational tools, what tools they select, how they analyze and considered them to be good and useful to support their learning needs and the determinants to the overall impression of the technological tools used. External factors such as financial state, employment status, parenting status, marital state, the level of academic qualification and time prior to re-enrollment and low level of interaction with technological tools for education were key determinants to the learner's overall perception. Using learner interaction theory, their research looked beyond just the technology and the learners, but how using technology they interacted with the course content, the lecturers or teachers and their own classmates, the technology, and its features and lastly the process of learning itself (Cherrstrom et al., 2019). Cherrstrom et al., (2019) interests were in the way



these factors can change the mindset of the students (who had not used technology before), their understanding while relating with technology and their cognitive structure. If the perception of the students towards these tools must be understood, then understanding how they selected them and the basis for that was key (Cherrstrom et al., 2019). This can be a useful theory for accessing technology solely within a learning context.

### 2.3.2 Technology Acceptance Model (TAM)

This model was used by Pituch and Lee (2006), to test and explain the perceptions of users to the use of technology as a supplementary means of learning in addition to traditional or online learning modes. Technological adoption model looks at perceived ease of use, while hinging on the belief of users that the technology in use can lead to improved performance. Human behavior and attitudes towards technology is thus centered on this (Pituch and Lee, 2006). TAM can be used to know intentions and the reasons behind the intentions of users towards technology. Hanif, Jamal and Imran (2018) used the technology acceptance model to check the factors that influence the behavior of students towards the use of technology. These factors condition the behavior of students, and they were considered to affect the way students used and embraced technology for education purposes. TAM relates to the level of effort a user thinks would be needed to use a technology and ease of use is key as it measures perceived usefulness (Chiu and Wang, 2008). TAM was explored and measured by Hanif, Jamal and Imran (2018) by using six constructs in the bid to understand what influenced students' (digital learners aka digital natives) behavior towards the acceptance of e-learning. These constructs include the use of the system in aiding the students to produce positive results, how other users of technology for learning influence others to use it, the feeling of satisfaction from the use of technology, the ability to carry out tasks with the technology, the support and resources available to support the technology been use and lastly the system accessibility. Using a questionnaire, students' opinions on the relationships between these constructs were gathered and the model was further grouped into perceived usefulness and perceived use with attitude/behavioral intention key to the student's adoption (Hanif, Jamal and Imran, 2018).

### 2.3.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

This is a unified theory formed by the review and integration of 8 models used in IS research to explain and understand the behavior and interaction of users with technology in an organization. Elements from these models were integrated to formulate the UTAUT (Venkatesh et al., 2003). The models synthesized by Venkatesh et al., (2003) includes, theory of reasoned action, the technology acceptance model, the motivational model, the theory of planned behavior, a model combining TAM and theory of planned behavior, the model of PC utilization, the innovation diffusion theory and the social cognitive theory.

This theory has seen been used by researchers like Chiu and Wang, (2008) who used UTAUT to understand user's actions by gathering and exploring technological and value issues, and comparing the benefits and





costs, as it relates to users' will to continue using that technology. To do this, Chiu and Wang, (2008) recruited part time students who only took web-based courses. Emails with a hyperlink to an online survey was sent to them, afterwards a questionnaire, pretested (around logical consistency, ease of understanding, sequence of items and task relevance), was prepared and administered seeking answers based on the students experience of the web-based learning systems. Venkatesh et al., (2003) also used field studies to capture the experiences and perceptions of users new to a technology, within an organizational setting and the study was concluded with a pretested questionnaire also administered to the users. Chiu and Wang, (2008) employed a Likert scale ranging from strongly disagree (1) to strongly agree (7) to gather and measure the experiences of the participants as it relates to the tools they used for web-based learning. Same type of scale was used by Venkatesh et al., (2003), even though for their study, they aimed at behavioral intention, measured using a 3-item scale with perceived voluntariness used as a check. A 7-point scale was used to measure constructs like individuals' attitude towards the technology, intrinsic motivation, perceived usefulness, complexity, social factors, facilitating conditions, and even its fit for use to the task at hand.

The method employed by Chiu and Wang, (2008) showed that performance expectancy and perception on long term usefulness had effects on the retention of that technology by the users (value/benefits derived was a key determinant to continuous use or rejection). The experiences of the users in Venkatesh et al., (2003) was gathered from the moment of introduction to the stage of experience (continuous use); and it was done to remove the limitation of cross-sectional or in-between comparison of experience (Venkatesh et al., 2003). UTAUT is based on performance expectancy, effort expectancy, and social influence; said to be directly related to intention of use and facilitating conditions (Venkatesh, Thong and Xu, 2016). UTAUT can be used to aid our understanding of the acceptance and use of technologies, even though it is lacking in the aspect of value (Chiu and Wang, 2008). The methods used in both studies are among some of the several methods used in IS studies to gather data that can be used to investigate an area of interest or to gain insights and answer research questions. The behavioral intention of users which makes them to want to use a technology is hinged on performance expectancy, effort expectancy and social influence; while facilitating conditions determine its final actual use (Venkatesh, Thong and Xu, 2016). One indicator of success from the use of technologies can be said to be from user's continuous use and loyalty (Chiu and Wang, 2008).

## 2.3.4 IS Continuance Model

Lin (2012) used a survey instrument (questionnaire) to gather and measure students' intentions to continue using virtual learning system. The measurement was done using a 5-point Likert scale (5 for strongly agree to 1 strongly disagree) across the following constructs, perceived fit, satisfaction, continuance intention, and impacts on learning. IS continuance model can be used to investigate the outcome from the use of technologies or learning systems and how it has impacted on learners' performance to want to continuously use them (Islam, 2013). Limayem and Cheung (2008) posited



that satisfaction and behavior had a direct link on continued use of information systems. The success of any implemented digital technological tool adopted by students can be said to be when the students move from initial adoption to the continual usage of such tools (Limayem and Cheung, 2008). Lin (2011) makes us understand that users do not instantaneously adjust from traditional learning style to online learning mode and understanding the issues they might have had by looking at the user's experience can help users and educators evaluate the success of the IS usage. With the aid of an online questionnaire, a survey was also done by Limayem and Cheung (2008) to gather the experiences of students and factors that determined the retention of their learning technologies, and just like Lin (2012) the experiences were measured across perceived usefulness, confirmation, satisfaction, continuance intention (continued use), and in addition habit and prior behavior (initial use).

Lin (2011) took a different approach to explore factors that could be termed as 'negative critical incidents' hinged on user's experience, ease of use, perceived assistance and usefulness in achieving their goal as the determinants to continuous use technology. Lin (2011) administered questionnaires centered on negative issues to students who had used e-learning services. The continuous use of technology for learning, between when the user embraces it to post-acceptance, then issues that may have affected or have been encountered by the learners that prevented the smooth run and operations such as friction, discomfort, anxiety needs to be explored as they are key antecedents to the continuous use of technology for learning. This theory goes beyond the immediate but seeks to help us understand the position of the learners from a post experience level and by focusing on their negative experiences and thus understand their intentions to continue using such technologies (Lin, 2011). The transition from traditional learning styles to online cannot be said to be without challenges, and the challenges fizzle out with time, an important element that could decide the eventual decision of the learners to continue the use of such technologies and the outcome of their learning (Lin, 2011). This model explains what makes users continue using technologies, and what informed their intention to do so.

To close this chapter, the theoretical framework that would be used for this research will be the UTAUT and the IS continuance models. UTAUT as it a unified model which includes elements from TAM model and 7 other models used in IS research to investigate the factors that are the determinants of intention to use, the actual use of technologies, and the factors that leads to sustaining such technologies in an organization; consequently, it's success (Venkatesh et al., 2003). IS continuance model because it can be used to investigate and understand the values issues (negative or positive) as it leads to user's continuous use and loyalty. It will be key to understand the perception of the students on the future use of these technologies, and that will inform that decision. The data to be collected will be measured based on the following constructs: performance expectancy, effort expectancy, social factors (motivation and isolation, lack of social interaction), perceived fit for the task, satisfaction, and intention to continue using technology for their future learning needs. With IS continuance, the outcome and the intentions of the users to continue using the technologies even when it is up to them to decide based on their expectations if met or not, can be investigated.



### 3 Methodology

To find answers to the research questions, this section will explain the research design for this project. It will include the philosophical worldview, the research approach, research methodology, the method of data collection, how the data was processed, analyzed, and stored. The research design described in this chapter will form the blueprint that will guide the research (Creswell and Creswell, 2018).

#### 3.1 Philosophical Worldviews (Paradigm)

Three philosophical worldviews are commonly used in IS research, the positivist, interpretivist and the critical philosophical worldviews. To understand the relationships between humans, technology and how they interact, Orlikowski and Baroudi (1991) argued against the collective use of a philosophical idea (referred to then as a dominant worldview), the positivist worldview, which primarily revolves around formal propositions, measurable variables, testing of hypothesis with the aim of making inferred conclusions. Two limitations were mentioned by Orlikowski and Baroudi (1991) regarding the positivist paradigm, first, it disregards historical and contextual conditions that could influence human action as it aims to make a generalization and secondly, it predicts reality without considering the role human actors play within their social reality or context. The research of Orlikowski and Baroudi (1991) led to the introduction of the interpretive and critical philosophical worldview, and they argued that they could be useful in gaining more understanding into how humans interact with technology within a context or setting and the role social factors play.

Interpretive studies look at meanings that emerge, based on the human understanding, their interaction and relationship with information technology. It accounts for varying subjective meaning, humans attribute to their experience with technology as they seek meaning to the interaction with technology within the context with which they belong (Creswell and Creswell, 2018). No variable is considered, no generalization is aimed at, but the researcher draws a conclusion from what emerges, from the meaning people make from the reality within their contextual situations with which they interact with technology (Orlikowski and Baroudi, 1991). This differs from the positivists philosophy which is deterministic, looks at cause and effect and outcomes from causes are studied via experiments, numeric measurements of observations and behaviors, and the testing and verification of laws and theories (Creswell and Creswell, 2018). The critical worldview also referred to as the transformative worldview by Creswell and Creswell (2018) seeks to making a change and considers marginalization, power and social justice, discrimination and oppression. Transforming social reality by critiquing the contradictions and conflicts within existing social structures is what the critical worldview considers (Orlikowski and Baroudi, 1991).

For this study it is important to choose the right philosophical worldview that will fit the purpose of this research. The perceptions of students who have used technology compulsorily during the pandemic would be gathered and from this, an informed understanding of the meaning they made of it within the context of a learning environment formed. The interpretivist



philosophy is better suited to make an informed meaning from the perceptions of students, as it forms into social constructs and aid our understanding of the new way of life (albeit temporal or could be said to be long lasting if the health situation persists or based on the recommendation of the country's health agency). Interpretivism involves a build-up of social constructs, it considers the role of behavior, and it is very important as accommodates and takes cognizance of the various meanings people make out of their use of information technology (Creswell and Creswell, 2018). It doesn't just stop at the human and technological elements but accommodates all other present factors and variables surrounding them. If we must gain an understanding into the meaning individuals have from their own point of view, towards the use of only technology for learning now, it will be beneficial to let this emerge, and the interpretivist worldview would aid in interpreting the outcome (Creswell and Creswell, 2018).

The positivist philosophical worldview doesn't fit this study because the behavior of students will not be captured with quantifiable variables, neither will it involve testing of hypothesis and interpretation of the situation based on those factors. With the knowledge that no two situations can be same, and humans are conditioned also by experience and environment, humans will interact differently with information technology. Walsham (2006) supported the use of interpretivist philosophy over the positivist philosophy by reiterating the outcome of a previous research conducted in 1993, which stressed that social constructs are formed by humans as they interact with technology, and the sense making from these interactions are subjective and not objective. This research does not aim at causing any change, neither it is looking at marginalized group of people. The study is not going to critique the social settings but understand the interaction between the students and technology within a context, from the eye of the students themselves. This thus makes the critical philosophy unsuitable for the research.

### 3.2 The Research Approach

A research approach guides the researcher on how to use the assumptions from the philosophical worldview to how data should be collected, analyzed and interpreted. The philosophical worldview, the research approach, research methods are all linked together and guides the organization of a research setting (Creswell and Creswell, 2018). There are 3 research approaches, the qualitative, quantitative, and mixed method. In selecting a research approach, it is important to see that it fits the research context, the problem been addressed, the data gathering method, the analysis, interpretation and the conclusion (Creswell and Creswell, 2018).

The qualitative approach is inductive in style, seeks to understand user's experiences Cherrstrom et al., (2019), and researchers who use this method let the outcome emerge from the study. The setting is usually within the participants environment, with the researcher detaching his preconceived beliefs or notions to prevent bias, with the aim of gaining in-depth understanding solely into the social constructs formed by humans interacting with information technology and the meaning they give to these relationships (Creswell and Creswell, 2018). The result is not what the researcher preconceives or imagines, but rather the outcome of data gathered, and the use



of the data to make interpretations of what and how the people interacted with the technologies and what they make of it. The qualitative approach goes with the interpretivist philosophical worldview.

The Quantitative approach involves testing measurable variables, collecting, and analyzing data in statistical ways and theories too (Creswell and Creswell, 2018). Contrary to the inductive qualitative approach, the quantitative is deductive in nature with the result reproducible and generalizable in manner (Creswell and Creswell, 2018). This research aims to see the meaning people make of their interaction with technology within their context emerge, it will not test the validity of the results of other researchers, thus the quantitative approach will not be sufficient to provide answers to the research questions.

The mixed method approach is a combination of both the inductive and the deductive approaches. These approaches can be used either concurrently or sequentially to gain insights to the situation been studied (Venkatesh, Brown and Bala, 2013). Data collected from both methods are combined to form a new set of data that can give a deeper understanding of the subject beyond what the quantitative or qualitative approaches can yield if used exclusively (Creswell and Creswell, 2018). Venkatesh, Brown and Bala (2013) describe this approach as one that encourages methodological pluralism with the aim of finding rich insights to research purpose, problems and questions. Furthermore, this method should be used if the research setting, questions and purpose fit appropriately. Whereas qualitative methods have been used in IS research to explore, quantitative methods have been used for confirmatory studies, and the mixed methods affords the researcher the opportunity to explore and confirm within a single study (Venkatesh, Brown and Bala, 2013).

The mixed method approach will be used for this research. The purpose is for completeness/complementary reasons. Complementary because the qualitative will be used to get more insights and deeper understanding from the results of the quantitative study and completeness as the data from the qualitative study will give a richer explanation of the situation under study (Venkatesh, Brown and Bala, 2013)

Qualitative and quantitative methods of enquiry would be applied to aid our understanding and seek answers to our research questions. The quantitative method will precede the qualitative method as it will be used to set the foundation for this study. The quantitative data will be collected and analyzed in a different phase and then the qualitative can be done in another phase (Venkatesh, Brown and Bala, 2013). Since the subject of this research can be said to be somewhat novel and peculiar (a pandemic that affected the world and caught us unprepared), neither has there been a situation where students had no total control or choice over mode of learning but 100% use of technology for education; the qualitative approach will serve as the approach to follow up on potential gray areas from the quantitative data. In other words, these methods will be used sequentially, to get deeper insights and a better understanding of the situation at hand. Termed as explanatory type of mixed method by Creswell and Creswell (2018), the qualitative method will build on what was gotten from the quantitative data and help to explain the quantitative results (Venkatesh, Brown and Bala, 2013). The aim of using the qualitative



approach immediately after the quantitative, is to allow the social constructs build; and so, that it is possible to get an understanding of the meaning the students make for themselves of the new mode of learning. Described as valuable in its approach, the mix method integrates the open-ended nature of qualitative method and its data with the close-ended quantitative method in a single research study; and this helps to check and balance the research thereby eliminating bias, preconceived expectations, or notions (Creswell and Creswell, 2018).

### 3.3 Research Methodology (Strategy of Inquiry)

This outlines the way data will be collected, analyzed, and interpreted. It forms the basis for the strategy of enquiry. Creswell and Creswell (2018) explained the choice of a methodology to be hinged on the role of the data to be collected and what researchers hope to find from the data. For this research, the first set of data to be collected will contain information, quantitative in nature. The responses will be short and direct, will not give further information as the why, the what and how the students responded. To get further clarity a secondary method will be employed aimed at eliciting more information from some of the participants, with the opportunity to further express themselves in their own words. This will make it easy to get an understanding of the meaning they attributed to what, why and how they felt with recourse to the responses from the quantitative method. The secondary data collection method will be qualitative, aimed at seeing social constructs emerge from the participants, and a sense of understanding of their relationships with technology within the educational context. This secondary method, in an inductive style will aid the understanding of the subject matter. The next sections will talk on the specific data collection methods, that would be used and how and when they would be used.

### 3.4 Method of Data Collection

In IS research, numerous techniques can be used to collect empirical data. From the use of open-ended questions to emerging approaches, text and image data, interviews, observations, to the use of documents and audiovisual data (Creswell and Creswell, 2018). To start the data collection, a closed-ended survey (administered online) will be sent out to gather quantitative information from students on the subject matter, and once the analysis of the data gotten is done, it will inform the formation of the qualitative data collection method that will be rolled out. The qualitative data will be collected through interviews to gain deeper understanding into the thoughts, patterns observed, and the choice of the students based on how they answered the survey and the areas that might provide deeper understanding of the phenomenon of interest. In Evans (2013), to gather the perception of graduate students' learning effectiveness when doing face to face Vs online courses, data to be evaluated was collected using surveys and then interviews followed. This helped to gain a deeper understanding of the research conducted.

#### 3.4.1 Online Survey (Quantitative method)

To collect the quantitative data, a survey was designed and administered to a specific category of students, registered only for on campus



learning. Surveys can be used to get exploratory, descriptive or explanatory data from sample population (Pinsonneault and Kraemer, 1993). A brief description of the aim of the data, the purpose of the survey and how the data will be used was described on the survey instrument. The survey contained linear scales that ranked from very unsatisfied to very satisfied (1 to 5), multiple choice answer kind of questions, questions that had checkboxes and the respondent could tick multiple answers. A specific timeline was set for administering the survey and data collection stopped as soon as data to inform the formation of the next step of the data collection was possible. It is important to note that since the thesis had a deadline, time was of essence, and it was not possible to linger for too long on any stage. The design of the survey was done taken into consideration recommendations from (Creswell and Creswell, 2018). This survey was designed on Google forms, administering it online made it possible to see responses as they came in. Google forms is an application owned by google used and supports data collection using forms. There was no cost incurred to do so as this survey was posted in public social media groups, so it was electronic. The link to the survey copied and shared via email, messaging apps or any other means and the respondents could click and be taken to the form where they could answer the survey and the responses saved automatically. The survey was designed to be relatable with the current situation, such that students do not get bored when responding. Since it will not be possible to be administered physically, it was designed to be interactive. All responses were completely anonymous.

The survey link was posted in groups on social media comprising of mostly campus students. Groups on platforms like Facebook and WhatsApp. Initial responses were low and further appeal made to members of such groups to share the links within their network to enable me gather as many data sets as possible. Since LNU comprises of both on-campus students and students enrolled for distance learning, it was easy to identify such groups on the social media platforms. Some of the campus groups sent to includes, LNU Campus group, Future Flatmates – Vaxjo and LNU football group. Furthermore, I also reached out to those within my network, friends in other department and faculties at graduate and undergraduate levels. Students registered for campus taught studies within and outside LNU but within Sweden. And to reiterate, these are students registered for courses that would have been 100% delivered in an in-class (person to person) format on campus, international students in Sweden (students from other countries) students that would have had lab sessions, students who had in class studies and maybe supplementary use of technology at some times but not totally, etc. These groups were carefully identified to assist in getting the rightly needed quantitative data from the right set of people. The responses from the closed-ended survey exposed areas that needed to be focused on when the qualitative method starts.

It would be recalled that one of the primary reasons for doing this is to aid the identification of the salient areas that could need further investigation. In all, a total of 37 students responded to the survey, two (2) responses were taken out as the respondents said they were not campus students, 2 students gave incomplete data, and their data was removed. The time stamp for when the data was collected was also removed and no personal data requested. For this stage of the quantitative analysis, responses from 33 students were



analyzed and validated to ensure that the data was complete and fit for use. A sample of the online survey can be seen in **Appendix A**, and this was adapted from Quispe-Prieto et al., (2021).

In doing online surveys, Hartmann (2009) called for caution as they might just give just surface information with no depth. It could also be difficult to isolate response bias, spot errors and in some cases the role of theory and its application towards the generated data. But since this research doesn't rely 100% on data from this method alone, it can be said that the qualitative method for data gathering, will act as a tool to get more information, validate and accommodate for the laxities in the online survey. The aim is to get the understanding of the participants from their point of view and the meaning they accord to the subject matter within the context of academic learning. An overview of the demographics of the respondents can be seen in the table 1.

Table 1. Overview of the respondents

Demographics of the respondents								
s/no	Age		Faculty (Area of study)		Level of study (UG/PG)		Residence	
	20 - 24	10	Business and Economics	3	Undergraduate	8	International student	24
	25 - 30	13	Computer science and IT	2	Postgraduate	25	Local (resident in Sweden)	9
	31 - 35	4	Natural Sciences	2				
	36 - 40	6	Social and Behavioural sciences	13				
			Technology and Engineering	12				
			Others	1				
Total	33		33	33	33			

### 3.4.2 Semi - Structured Interviews (Qualitative method)

This was done as soon as the data from the survey was analyzed, and areas of interest highlighted. These areas will shed more light on the issue at hand and provide deeper understanding and answers to our research questions. The students will be able to expand more on the reasons that informed their decisions on how they responded to the survey and the meaning they give to their reality and experience. Interviews are good for collecting qualitative data and getting the meaning participants make of the situation under investigation (Walsham, 2006). When interviews are carried out, the interviewer can ask participants to build upon responses easily and immediately. The participants also get the opportunity to clarify or add to initial responses that have been made. It helps to clear out confusion as both parties can be clear on the questions and answers, and the respondents can also answer to the best of their ability, knowledge and experience. In the end, social constructs from the responses will be built.

For this process, 5 people volunteered to be interviewed. The inclusion criteria only required them to be university students registered as campus students in Sweden but were not limited to Linnaeus University. These participants also took part in the online survey, so they had a clue as to the research been conducted. Due to the restrictions and recommendations from the Swedish health authorities, two (2) of the interviews were conducted





physically but with social distance maintained. For the remaining interviews, two (2) were conducted online using zoom technologies and the last one (1) via phone call. The interview questions were sent to the participants beforehand and with an informed consent form. A sample of the interview question can be seen in **Appendix B**.

Before starting the interview, the participants were verbally informed of their rights to withdraw from the process at any point in time if they felt like, their rights to refrain from answering any question, made to understand that no personal data would be needed or collected, the information gathered also would be treated in accordance with the GDPR rules and lastly, verbal consent was sought and gotten for the interview session. This interview sessions were all recorded (audio only) based on participant consent and approval, and they all lasted for less than 30mins. The interview started with questions on their background and then learning experience and lastly questions on perception regarding use and satisfaction. At the end, all the participants were thanked for participating. A summary of the process and participation can be seen in table 2.

Table 2. Overview of the Interview Participants

Summary of interviewees			
Interviewee(S/No)	Student Status	Study Area	Duration of interview (Mins)
1	Campus based	Social Science	24:46:00
2	Campus based	Business and Economics	23:15:00
3	Campus based	Technology	26:37:00
4	Campus based	Technology	26:49:00
5	Campus based	Informatics and Media	25:11:00

### 3.5 Data Analysis

Since this research was conducted via a mixed method approach, the way the data from the survey and the interview would be analyzed will be different. The quantitative ended before the qualitative method started. The analysis of the survey from the quantitative approach was key to setting up and conducting the interviews. Thus, the analysis of the quantitative data collected will be discussed first as it lays the foundation for the use of the qualitative approach which involved the use of interviews. The interview data will then be analyzed. In information systems, surveys can be a useful tool in discovering insightful areas and then other methods of data gathering can be rightly applied towards acquiring more information and subsequently knowledge (Pinsonneault and Kraemer, 1993).

#### 3.5.1 Descriptive Statistics

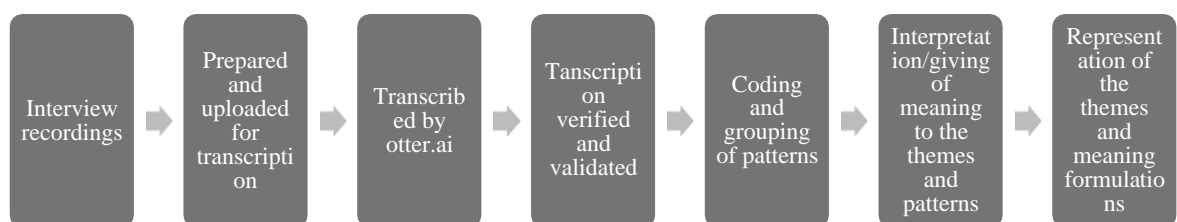
This helps in getting insights from data by looking at what, the events and opinions of amongst a sample population (Pinsonneault and Kraemer, 1993). Descriptive statistics can simply be done using counts, means or percentages (Boudreau, Gefen and Straub, 2001). The response gotten from the survey sent out was low (33 respondents), and this approach was most suited for the research. No statistical analysis or calculations will be done as



the data might not be sufficient. Most of the data from the survey were immediately converted into pie and bar charts (the Google forms could do this) and this made it easy to get patterns from the responses and revealed areas that will lead to better understanding of the situation under study. These charts were extracted based on the research purpose to see how respondents answered and then, to illustrate our results and areas of interest. This will also aid in the formulation of the interview questions where more clarity on the subject matter and answers to the research questions can be gotten via interviews. The use of charts was also used in the research conducted by Pinsonneault and Kraemer, (1993), to illustrate the assessment of survey research methodology in information systems. This data analysis method for quantitative data was also used by Boudreau, Gefen and Straub (2001) in their quest to investigate the advancement of validation of quantitative data in information system research.

### 3.5.2 Thematic Analysis

This was applied on the qualitative data collected via the interview session. In qualitative studies, the goal is to make sense of the data (usually in the form of words) by tearing them apart and segmenting or coding similarities till the researcher can get key concepts and make sense of the data (Creswell and Creswell, 2018, Lichtman, 2013). The outcome of qualitative studies is inductive in nature and thus, researcher will look out for patterns, categories, themes from which the answers to the research questions would be explained or a conclusion drawn and meaning to the realities of participants understood (Creswell and Creswell, 2018). To ensure that no information was lost, all the interviews were voice recorded. The recordings were then transcribed using otter.ai (a free tool available online with the ability to convert audio and video recordings, or live speech to text). Once the transcribing was done for the 5 interview sessions, the text was then re-examined with the original recording to ensure completeness. This was also to ensure that the areas wrongly transcribed were corrected and nothing was left uncaptured. It was important to do so to be sure the data was reliable, not distorted, complete and to show responsibility for the data collected. Once a data set is complete and whole, reoccurring data can group together based on occurrence and in relation to a selected specification, this groups of similar data form codes according to purpose, and from the purpose, themes are generated which then represent the meaning the participants give to the situation under study (Cherrstrom et al., 2019). A summary of this can be seen in **Figure 2**.



**Figure 2.** Data Analysis Procedure for the Interview data (Adapted from Creswell and Creswell, 2018)



The interview recordings transcribed in this research formed the raw qualitative data, and the key concepts would be the themes identified after the data has been coded, grouped, and categorized. Data analysis for the interview will be inductive and iterative in nature in consistence with qualitative research that is inductive as it is applied within a study and its context (Lichtman, 2013). Lichtman (2013) acknowledged the challenges and conflicting issues that could easily arise when it comes to analyzing qualitative data and suggested a systematic approach to maintaining order and sense making of the qualitative data. Just like Creswell and Creswell (2018), Lichtman posited the 3 Cs of data analysis that can be used on qualitative data, coding, categorizing and concepts. The categorizing and concepts from Lichtman correspond to Creswell and Creswell's grouping of patterns and representation of themes based on their meanings (they aim towards the same destination). Taking a cue from Lichtman (2013), the interview data will go through the following steps.

1. An initial coding from the responses received to get a summary idea. This will be in the form of words or brief phrases.
2. A revisit of the initial codes to refine what was initially done to remove the redundant codes, merging similar codes, renaming where necessary and making the codes that makes sense consistent as they will form the categories.
3. A list of categories (grouping of patterns) would be developed by bringing together codes that can become topics. Related codes will be categorized.
4. Modification of the categorized list will be done by reviewing the responses iteratively for consistency.
5. The list of categories and subcategories will be reviewed again to isolate redundant ones and retain the important ones that are consistent and will provide more insights on the study (these become the themes)
6. The categories become concepts and these concepts become the representation of themes and consequently the emergent meaning from the data.

The initial coding was done using the descriptive coding method suggested by Saldana (2011), which is said to be effective and applicable to data sets from interview transcripts and had the ability to aid the formation of categories from the codes. This process was iterative, and recourse constantly made to the interview transcripts. It was immersive and at the initial coding stage, focus was on key phrases and there was no limit on the number of codes at that stage. A total of 170 codes were initially gotten. After this, the initial codes were reviewed and similar phrases merged, some codes were removed. These codes did not add much to the study. The codes that related were grouped and before they became categories, the iterative process was done again to be sure everything considered important was captured and nothing was left hanging. These grouped codes formed the categories which subsequently led to the themes/concepts that will lead to answers to the research questions, explain the meaning and social constructs that emerged



from the interaction of students with technology within the learning context and environment. A part of the initial codes generated can be seen in **Figure 3** below.

used zoom technologies before corona for online students, moodle	I want online lectures to end	used zoom and ICT tools before corona. Class was mixed with campus and online students	I will not register for online classes as it is difficult to motivate	Yes, we all used technologies in the form of computers, phones, social media apps for group work and to stay connected with classmates and presentation tools e.g google docs and SPSS. I did not use zoom or another technologies for academic activities before corona
no issues with the digital tools we had access to	Group work did not make me feel isolated	it was seamless, felt like no transition, we were already used to it	I prefer in class learning over online	
I had no need for IT support	Technology was convenient to satisfy my learning needs	IT support was good and responses were almost immediate, but atimes you had to wait, then for weekend issues, by Monday responses came	all the stakeholders did their best and I was satisfied. There was pressure to deliver on both sides, and they put in their best to make it happen	once covid came, zoom, Skype, Email, Facebook Messenger
Google docs, WhatsApp, Phone calls	Technology is not the best way to go, you also learn in class, amongst your colleagues	WhatsApp, Google docs, Skype	technology was convenient for me. It was top notch	We got some instructions on how to access, download and set zoom up
problems were mine not from the tools provided	Softwares are good,easy to use and works but I preferin class learning	It felt like I was struggling, it became difficult to understand and then I mostly could not wait for the class to end	I had a good run with technology for my program but I know some one that had a not so great experience because her teachers had not used technology beforecovid	I needed IT support, had to deal with long waiting times too, sometimes hard to get your problems solved instantly. They had opening hours so they were not available 24/7
Used zoom for workshops and it was effective	satisfied with online learning (7 out of 10)	Having classes online made me lazy, I did not need to prepare mentally like when I had to go for pyhsical classes	I am grateful. We did not see this disruption coming but with the use of technology, we were able to transit online and continue our studies	Issues like time restrictions, not been able to get into a room cause others are there, not getting the invite, sometimes the IT support do not get your mails on time

**Figure 3.** Excerpt from the initial coding process

### 3.6 Reliability and Validity

Creswell and Creswell (2018) posited that validation of findings should not be at a particular point but should be done through the course of the research process. How data is validated in quantitative is also different from how data is validated in qualitative studies. For the quantitative data, it will be recalled that when the survey responses were collected, they were initially checked for completeness. Reliability for the quantitative data will look at the quality of measurement, since the results from the quantitative study can be quantified with the use of numbers or scale. Reliability of quantitative data relates to the reproducibility of such data (Venkatesh, Brown and Bala, 2013). All incomplete responses were removed, the survey was meant for only campus students, and this was explicitly stated, and respondents that indicated their student status as not registered for on-campus learning their responses were removed. This was part of the process of validating the quantitative data to be sure of reliability at the end of what has been collected and the findings were accurate (Venkatesh, Brown and Bala, 2013).

For the validation of qualitative data Creswell and Creswell (2018) mentioned some strategies that can applied to qualitative data. In qualitative studies, reliability is linked to validity and if the qualitative data can be validated, the data can be said to be reliable (Venkatesh, Brown and Bala, 2013). The use of multiple strategies was also encouraged. The qualitative data gotten was validated by cross-referencing the themes based on participant responses



amongst each other for coherency (triangulating), giving time to the participants to clarify and expand on their answers during the interview, clarifying questions and the purpose of the questions asked to avoid any form of confusion, clarification of bias (Creswell and Creswell, 2018). It was not possible to take back the transcripts to the participants to check for errors in their interviews or for discrepancies, an approach called “*member checking*” by Creswell and Creswell (2018) due to time, but the triangulation and prolonged time spent during the interview raised the confidence and validity of the data gotten. Validity in qualitative methods should ensure that what is reported is accurate, interpretations are based on the true meaning and understanding of the participants words (no ambiguity and there is clarity) and the data can be backed by theories that fit appropriately to the data (Venkatesh, Brown and Bala 2013).

For mixed methods research, Venkatesh, Brown and Bala (2013) argued that validation used for quantitative and qualitative research should not be the case and supported the new term “inference quality” for validity and “data quality” for reliability. Data quality looks at trustworthiness and how dependable the measures are while inference takes into consideration the interpretation of the data *vis-à-vis* the conclusion. Every factor must be considered, from the research purpose to the research questions and the context by which the study is conducted (Venkatesh Brown and Bala, 2013). At the end, validation can be said to be guaranteed if the overall findings (meta-inference) from the mix methods leads to understanding the phenomenon of interest.

To be sure that all the data collected were reliable and good enough for the study, every data source was checked and rechecked for discrepancies. The quantitative data was collected via an electronic means as it would be recalled (google docs) and the responses exported to a workbook. And the transcribed recordings were manually checked again to be sure that everything was captured correctly before the initial coding, categorization and till the themes were formed. Qualitative researchers use steps like checking and rechecking to avoid errors when coding from the transcripts. All these are to ensure that data and the research process is consistent and reliable (Creswell and Creswell, 2018). It is also very important to stick to the parameters used to define and categorize the data into categories, themes or codes.

Clarification of bias was necessary during this research because I am also a student registered for campus learning. There was a conscious effort at every point in time to see that I was not aiming at getting a preconceived finding. Termed as reflexivity, Creswell and Creswell (2018), described this as a good attribute of a researcher, it is important to state that report that would be narrated will solely be based on findings from the participants and the meaning they make to the situation in question solely within the context of this research.

### 3.7 Ethical Consideration

It is important to acknowledge in advance that there would be ethical issues to consider, putting this into consideration from the beginning till the end of the research process will help in avoiding any of such issues. Creswell and Creswell (2014), stressed areas in the process of research that ethical issues occur and how to avoid them. Some of the points as it would relate to



this research has been extracted and would be adopted for this study. This is summarized in **Table 3**. For the interviews conducted, an informed consent form was sent with the questionnaire to prepare the participants. A sample of the consent form can be seen in **Appendix D**.

**Table 3.** Overview of the Ethical Considerations

Where	Type of issue	How to keep issue in check
Before the Start of the research	How to use the information gotten from the participants and handling of the materials needed before and during the research	Purpose of the research was made clear on all the data gather tools (survey and interview documents), consent was gotten from the participants and credit for the materials used during the project must be given
Start of research	Identification of a clear research problem and gaining clarity on the objectives of the project	No ambiguity, and participants were contacted and briefed on the purpose of the research
Data collection	Deceiving or trying to exploit the participants, collecting data not needed	The purpose of the study was made clear and how the data would be used was stated. Building trust was key and no personal information about the participants were collected and the recordings stored securely
Data Analysis	Selective analysis, no consideration of privacy and identity of the participants	Analysis was done in an unbiased manner and reflection on the real data gotten from the participant. Where there was need to refer to a participant, aliases were used
Reporting, sharing, and storing of research data	Falsification of findings, disclosing information the participants do not want disclosed, ownership of data, conflict of interest	Even though it was not possible for the participants to verify the transcripts, steps were taken to see that accuracy was maintained. Plagiarism was also avoided in the cause of writing this research and the source of every data or referenced material disclosed



### 3.8 Limitation of Data Collection and Analysis

The data gotten from the quantitative online survey was low, just 33 people responded even though it was posted online on several platforms for weeks with several appeals made. Time was short and stalling would mean that other parts of the research would have suffered. I had to make use of the data received by the timeline set for quantitative data to have been collected so that analysis could begin. Most especially since both methods were not going to be used concurrently

Also, the interview had just 5 respondents and thus no attempt at generalizations were made and care was taken in making statements that could be seen to be the views of most of the students. It should be kept in mind that the inference made from this research was solely from interviewing 5 participants

It was not possible to capture the thoughts and feeling of what a participant felt entirely in themes and get conceptual meaning of the situation under investigation and thus, thematic analysis is somewhat reductionist in approach (Lichtman, 2013). This was evident in this research.



## 4 Empirical Findings

The result of the data gotten from the survey and the interview will be presented here. First, an analysis of the quantitative data and then the Qualitative. Venkatesh, Brown and Bala (2013) posit that for a study with strong theoretical foundations, but the context is novel, a quantitative study can be done and then the findings used to conduct the qualitative study to get more insights. Since a sequential approach was used, the findings of the quantitative study will be discussed and then how it led to the formation of the qualitative study which helped to get more insight and understanding of the research. The dominant method in this research remains the qualitative method and more rigor into how the analysis and findings was done would be seen. An explanation of how the initial codes led to themes generation has been discussed in the previous chapter. More discussions regarding the empirical findings of the qualitative data also will be seen here. The goal is to use both findings to develop a final set of findings called Meta-inferences. Meta-inferences are results of the integration of findings from a quantitative and qualitative element of mixed research (Venkatesh, Brown and Bala 2013).

### 4.1 Empirical Findings of the Quantitative Data

The findings from this survey relates to,

1. Use: based on performance expectancy, effort expectancy, fit for task and intention to continue to use technology.
2. Satisfaction which will include social factors (motivation, isolation, interactions in class, delivery)

It is important to do this to narrow down the area of interests based and stick to the purpose of the study within the context of learning, choice, satisfaction, fulfilment of academic needs, etc.

#### 4.1.1 Analysis of Data Relating to Use of Technology

This was done to ascertain how familiar the students were with the use of technology for academic activities before the pandemic. From the survey 81.8% of the students said they used technology before the pandemic while 18.2% said they did not. From those who had access to technology, 60% said they used it often, 36.4% said they used it sometimes and 3% said it was never used (please see **Appendix C**). Effort expectancy vis-à-vis issues can be seen to be almost equal. But when it came to intention of use beyond the pandemic, two thirds of the respondents said no and one third said yes. A summary of these parameters relating to use can be seen in **Table 4**. What informed this decision? What could be known? What factors played a role in the way the responses shifted towards not favoring the use of technology in the future.

Understanding the challenges can be key in letting the school administrators know what to do better, were the challenges with the students, the technologies, lack of technical know-how? Did this challenges hinder them in achieving their learning goals, how were they resolved? Who resolved the





challenges? All these are questions that begs to be answered as they could also be factors that affects retention or continuous use of technology.

**Table 4.** Excerpt of Some key Data from the quantitative survey questions

s/no	Survey Question	yes (%)	no (%)	not applicable (%)
1	Use of Technology before the pandemic	81.8	18.2	null
2	Use of other technological tools to collaborate	81.3	12.5	6.3
3	Challenges encountered while using technological tools	51.5	45.5	3
4	Use of technology for remaining studies	30.3	69.7	Null
5	Use of Technology for future studies	9.1	63.7	27.2

This survey was not sufficient to tell what, why and how the respondents chose to answer. For instance, were the tools provided by the school lacking for collaboration or why did they not use it amongst themselves? The fragmented results need to be probed further to understand the underlying reasons behind these results. This would also lead to investigations on the level of use and the capacity in which technology was used for learning. This is where the qualitative method takes over, and with the use of interviews, the students get to say more about the interaction with technology within the academic context and in their own words to get a deeper understanding of the situation.

#### 4.1.2 Analysis of Data relating Satisfaction

A linear scale was used to measure and gather satisfaction relating to how the students felt about constructs like use of technology for all learning activities, examinations, social interaction in class, delivery by the teachers, convenience, etc. and it measured the respondent's perception from a range of 1 to 5. 1 = very unsatisfied, 2 = unsatisfied, 3 = neither satisfied or unsatisfied, 4 = satisfied and 5 = very satisfied. **Figure 4** for instance shows most of the students, 51% of the sample population (17 students) were neither satisfied nor unsatisfied with the use of technology for all their learning activities (this includes practical, lab sessions, workshops). This kind of variation spurred my interest into knowing what could have led to that level of neutrality, and why some leaned towards the left. This is also an illustration of how the interview questions were formed for the qualitative method of data gathering. The interviews made it possible to probe further and seek understanding of the reasons behind the how, why and what influenced their satisfaction levels towards the use of technology for all learning activities.

The same approach was used for gathering the perception of students relating to use of technology specifically for examinations. The bar charts immediately show the result of what the student's perceptions were regarding the specific interest. **Figure 5** showed that just a few of the respondents were unsatisfied, and it can be inferred that most of the students' satisfaction levels as it relates to use of technology for examinations ranged from neutral to very

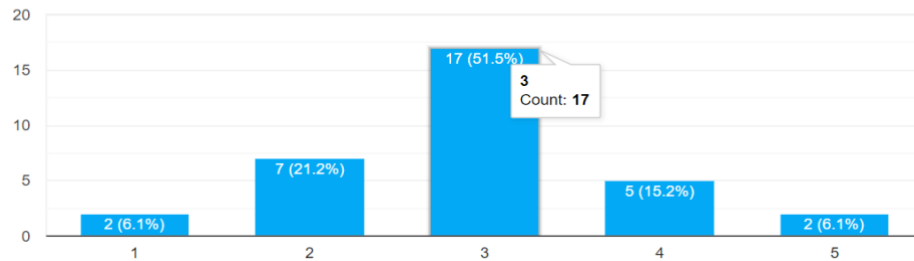


satisfied. Also, the qualitative method will take it from here to understand the how, why and what led to those results till a deeper understanding is formed.

How did it go with the use of technological tools for practical, lab sessions and workshops?



33 responses

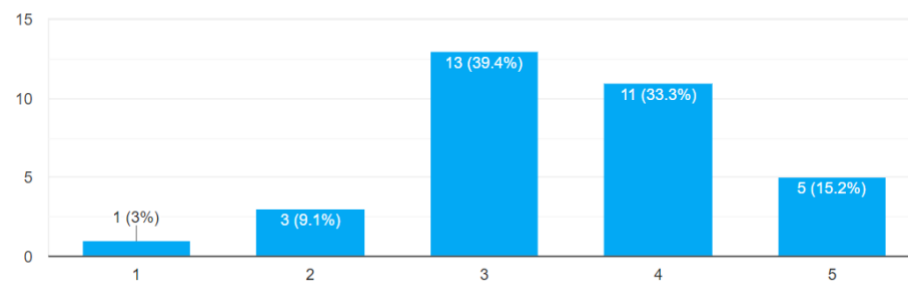


**Figure 4.** Perception of users on use of technology for all learning activities

How did it go with the use of technological tools for examinations?



33 responses

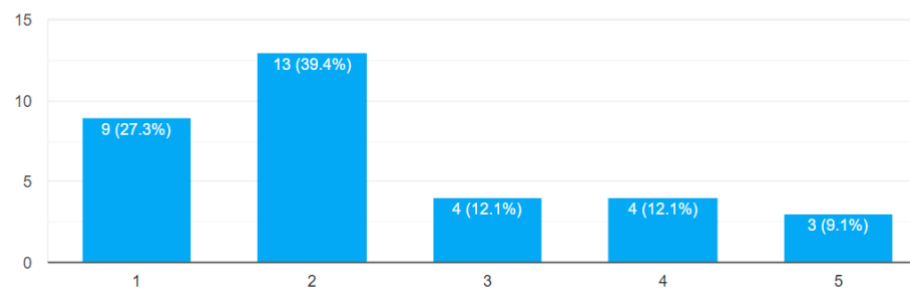


**Figure 5.** Perception of users on use of technology for Examinations

How satisfied are you with the social interaction in the class during online learning?



33 responses



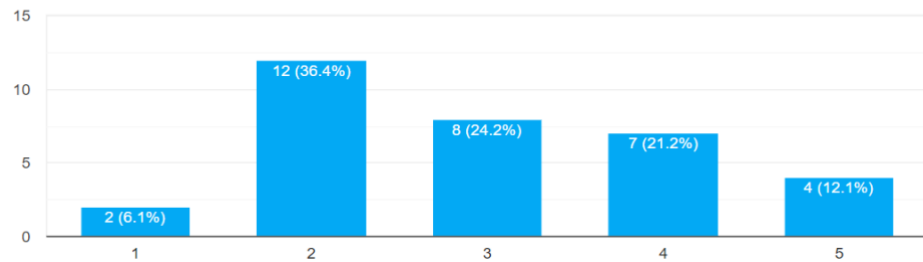
**Figure 6.** Perception of users regarding social interaction in class



How satisfied are you with the lecturers delivery/communication during the online teaching mode



33 responses



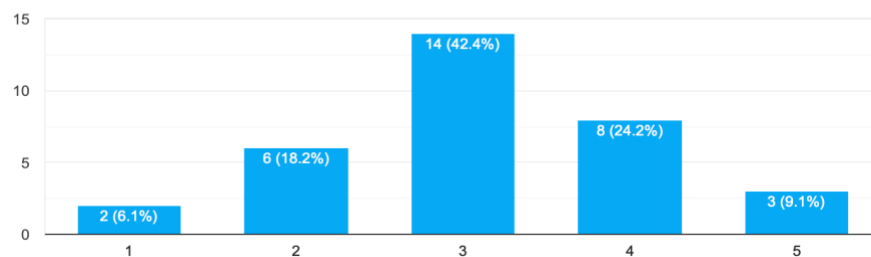
**Figure 7.** Perception of users regarding lecturer's delivery using technology

For the social interaction in class as seen in **Figure 6**, about 56% of the respondents said they were either very unsatisfied or unsatisfied. The perceptions of the respondents on delivery by the lecturers showed that about 42.5% of the respondents were either unsatisfied or very unsatisfied, 24.2% said they were indifferent, but we had 33.3% of the respondent saying they were satisfied with the lecturers' delivery. This can be seen in **Figure 7**. **Figure 8** shows the student's perception as it relates to convenience. And it was rated also using a linear scale ranging from 1 to 5. 1 = very inconvenient, 2 = inconvenient, 3 = neither inconvenient or convenient, 4 = convenient and 5 = very convenient.

How convenient was the use of technology in satisfying your learning needs?



33 responses



**Figure 8.** Perception of users on convenience while learning with technology

These results from the quantitative method are mostly self-describing with the chats, and they reveal how insights were developed into areas that could be further investigated with the qualitative studies. More chats from the quantitative study can be seen in **Appendix C**. The illustrations above, showed how the quantitative data gotten was analyzed and formed the foundation for the Qualitative method to begin.

## 4.2 Empirical Findings of Qualitative Data

From the survey responses, it was difficult to understand what informed how the students chose to answer the questions posed to them. But it was useful in formulating the interview questions and showing areas that can provide more insights to what, how, and why of the research that will aid and provide answers to our research questions. In chapter 3 an excerpt of the initial



codes formed was seen, after the grouping and regrouping, they were categorized, and these led to the formation of 6 themes. The themes will center on use and satisfaction just as it was seen in the quantitative analysis. With recourse to the constructs perceived usefulness, performance expectancy, effort expectancy, social factors, satisfaction and fit for use. The Concepts (themes) formed includes,

1. Theme 1: Digital technology before the pandemic
2. Theme 2: Need for other collaboration tools
3. Theme 3: Ease of Use
4. Theme 4: Technology for learning, examinations, workshops, etc.
5. Theme 5: Future use of technology
6. Theme 6: Social interaction, isolation and motivation
7. Theme 7: Delivery by teachers
8. Theme 8: Preferred mode of learning

#### 4.2.1 Theme 1: Digital technology before the pandemic

Amongst the respondents, one thing was common, they all had experience with technology one way or the other but mostly used it to support their learning needs, turn in school projects, assignments, check their grades and interact with their teachers. This system was referred to as the learning management system. At the least technology was used for carrying out seminars, guest lectures and for interacting with distance student who had joint classes with them the campus students.

Zoom, digital recordings hosted on the school management system, SPSS (Statistical Package for Social Sciences), video and audio equipment, computers and the internet were the tools said to be used before the pandemic.

#### 4.2.2 Theme 2: Need for other collaboration tools

WhatsApp, Facebook Messenger and Skype, Google docs, were identified as tools used for collaboration. All of these except the Google docs, are social media apps and sites that could be used on mobile or on the web. The choice of using this was mostly for convenience and they all said they were present on those applications and sites. One respondent said, *“we used Facebook messenger because almost everyone was on Facebook”*. Another defended their choice of using WhatsApp to be because *“For quick response and to make immediate calls to each other when we had group assignments and tasks, we used WhatsApp”*. This was one of the reasons why one of the interviewees gave as necessitating the use of other tools for collaborating with students. Even though they had zoom, they found other effective tools to collaborate and get their task done. A respondent said, *“one time we had a group mate in Canada, and he was also on transit, we all had to use Skype to have a meeting”*.

For convenience, reach and immediate response, they chose not to restrain themselves to zoom alone but harnessed the power from social media to achieve their academic tasks.



#### 4.2.3 Theme 3: Ease of Use

The process was said to be mostly seamless, and the technical issues attributed not to the tools provided by the school but to their own technologies. They all had it smooth. Technical challenges were little or non-existent. A respondent said, *“I am used to these tools and even when issues occurred, I could solve them”*, another said *“I had issues but did not contact the IT support for resolution because I knew it was my problem. It was probably related to my internet”*. The issues experienced was not with the tool itself but the users. *“Sometimes I found it hard entering an online class, because maybe the teacher had to let me in, and he was not there to authorize it and I had to send a mail. This led to delays and all”*.

The consensus from the respondent was that they had it smooth with minimal but surmountable issues, sometimes even within their control, while using technological tools for learning and carrying out academic activities.

#### 4.2.4 Theme 4: Technology for learning, examinations, workshops, practical, etc

Three of the respondents had no practical sessions or workshops as they did them before the pandemic. But for the remaining two respondents, they said they used it and it was effective. One of the respondents said, *“using technology for lab sessions was confusing, it was a programming session and using zoom, it became difficult to grasp what was happening as it required more time than it would have taken if we had done it physically”*. Another respondent that wrote an exam online said, *“using technology for examinations was effective but it lacked empathy, even if you had technical challenges, the technology has been programmed to cut off at a certain time and then you are helpless”*.

*“Basically, everyone uses like computers, phones, social media apps to stay connected with friends and communicate together via those technologies, so this made it easy to use the technologies provided for learning and also to collaborate”* said one of the respondents. The respondents all agreed that it was possible, and it will be effective to carry out all academic activities online. *“Even though I love campus learning, I found using technology for lectures and examinations effective”*. The effectiveness was not in doubt as the technology worked, issues were either with the students or lack of technical know-how. A respondent opined that *“the use of technology was okay for all these activities. Fun part was not needing to hurry to prepare and be physically present. From the comfort of my bed, I could put on my computer and attend seminars, lectures and take my exams”*.

Convenience played a major role in the responses the gotten. Also, the students were not ignorant to the use of technology for learning purposes. Before the pandemic struck, they used it as support and using it fully for academic activities did not look challenging. Even though they encountered minor issues, it was still said to be efficient and sufficient in carrying out their educational needs. Although a respondent called for caution to the use of technology for some courses. *“I think for courses like engineering, architecture, economics and some other applied courses, it might be difficult to take those courses online as the students might be half baked or not even achieve their learning goals completely”*.



These issues were not enough to discredit the use of technology effectively for workshops, practical and examinations, but based on the responses gotten from the respondents, technology worked.

#### 4.2.5 Theme 5: Future use of technology

A respondent said using technology for future learning needs was conditional. Simply put, *"I can only register for online studies if time and work will not allow me to be physically present"*. Whereas another respondent said *"I had the opportunity to register for online studies even before corona struck, but I almost never did finish those courses or programs. I did not gain much via learning online, it was more of a disadvantage to me than a blessing and a blend would have been preferred"*. Respondent 3 that did not give a positive response towards the use of technology in the future said, *"I found it difficult to motivate, it was not easy for me, I missed in class interaction where I could learn from my classmates"*. Whereas there was a conditional opinion towards the use of technology in the future, three of the respondents said no due to the reasons just outlined.

Interestingly one of the respondents gave a positive response to using technology in the future and it was due to convenience it brings. *"With online courses, you can take them from anywhere in the world and there are good courses, free and paid for that can be taken online and so yes, I will register for online courses"*. So, besides the conditions attached to using it, 4 out of the 5 respondents were not in favor of using technology for future academic purposes and if they had to use it, it had to be with a mix of classroom teaching and a means to support and not 100% reliance.

One respondent said, *"I just want it to end, and I cannot wait to go back to class"*. Another respondent *"I don't look forward to online classes, it is boring and less engaging, very rigid too"*. Another respondent *"No, I find it difficult motivating myself, it was not interesting, and I want to see people, interact with people and learn with people"*. A fourth response was that *"No, courses I once registered for, to be taken online was never completed. I want to be in class where I can partake interactive, active, lively, and intellectual discussions"*

From what has been gathered, this can help answer the question regarding the continuous use of technology even after the pandemic is over.

#### 4.2.6 Theme 6: Social interaction, Isolation and Motivation

Social interaction was missed by all the respondents, and it seemed like a major concern to the respondents. They felt isolated and attributed this to several factors. *"I do not even know the names of my classmates, one on one, I don't even know them personally. Most people were just concerned in attending the lectures and once done, the end"*. *"While learning, we make friends and network, in traditional classroom settings, this is easy to do, but online, it is difficult to connect."* A respondent felt that the introverted or quiet people's opinions and concerns gets suppressed while studying online *"in class, lecturers are able to read the facial expressions of students and tell if things are going well or not, some also encourage you to make attempts at answering questions and all. But in online class it felt like people were not about learning from each other, but rather showing that they knew more than"*



*the other students*". Social interaction and isolation were also hinged on not been able to see each other. *"There is a bit of intimidation when you want to contribute to the class. To contribute you had to unmute your mic and in some cases put on your camera. It felt difficult to want to be the one to be the first to say something"*. This is in relation to what one of the respondents said earlier. Discussions in traditional classes are devoid of tension and easy to do as it is easily moderated by the teachers who also can see what. Social interaction was really a big deal as *"most of the time, everyone's camera is switched off and you hardly even get to know who and who is in class or who was talking, except you is had a friend in your class"*.

One respondent said, *"I just want it to end, and I cannot wait to go back to class"*. Another respondent *"I don't look forward to online classes, it is boring and less engaging, very rigid too"*. Another respondent *"No, I find it difficult motivating myself, it was not interesting, and I want to see people, interact with people and learn with people"*. A fourth response was that *"No, courses I once registered for, to be taken online was never completed. I want to be in class where I can partake interactive, active, lively, and intellectual discussions"*

From what has been gathered, this can help answer the question regarding the continuous use of technology even after the pandemic is over.

With the use of technology, respondents felt isolated and did not feel socially connected to the discussions that held in the class and a respondent termed the whole situation as *"stressful"*. They had positive things to say about social interactions and no feelings of isolation in the traditional mode of learning.

#### 4.2.7 Theme 7: Delivery by Teachers

While a respondent commended the tutors' efforts *"even though in my department we were not used to using technology for learning, I will commend my teachers. They surely had issues when they had to migrate online, but it fizzled with time"*; another said *their delivery was kind of limited since they also did not experience such kind of pedagogical learning approach"*. A 3<sup>rd</sup> respondent suggested that training teachers on how to carry out distance learning would also be good. Summarily, the respondent alongside others were full of praise for the way the lecturers handle the delivery of the lectures with technology.

#### 4.2.8 Theme 8: Preferred mode of learning

Blended learning involves a combination of in class learning methods and the use of technology to support teaching/learning activities. *"Technology is swift and could be used almost immediately to clarify anything or search for anything online"*. Another respondent chose the blended mode of learning because *"there are some courses that the lecturers might need to invite guest lecturers, and they may not be in your region, these teachers can just be made to simply do online presentations from wherever they are in the world, and it will be simply transmitted with the students in the class"*.

The other respondent's choice of blended learning was based on convenience. *"A good blend of in-class and use of technology would be preferred. Sometimes you are tired and not physically able to go to class, but*



*with technology, you can stay connected. Flexibility and convenience is a key characteristics it brings*". This was a response from one of the respondents as to why blended learning would be preferred over in class or 100% online learning methods. It should be noted that one of the respondents chose traditional learning solely because "*it affords one the opportunity to meet and build relationships with other students*".





## 5 Discussion

The outcome of the analyzed data will inform the discussion that will be done here. It is not sufficient that the quantitative method informed the qualitative, but what are the outcomes from both? The path for this research was that a quantitative process was conducted first and then the qualitative followed, an aggregation of both results should lead to meta-inferences. Venkatesh, Brown and Bala (2013) posit that it is not enough to present the findings separately, but findings touching on both methods, within the context of the research should be integrated to form meta-interference, else the objective of conducting mixed research is said to have not been met.

Bracketing and bridging are approaches used to developed meta-inferences. Bracketing accommodates for divergent views in relation to the research interests and bridging brings together similar findings that supports from both methods together (Venkatesh. Brown and Bala, 2013). It should be recalled that the essence of using mixed study for this research was to develop a richer picture of the situation at hand. The quantitative and qualitative methods were done sequentially for completeness and complimentary purposes. The qualitative was to go beyond the information the quantitative study could give and thus elicit further information that could lead to a deeper understanding of the situation at hand. Bridging is considered suitable for sequential mixed method studies and bracketing is suitable for concurrent mixed method studies (Venkatesh, Brown and Bala 2013). Thus, the bridging approach will form the bases by which the meta-inferences would be formed. The aggregation of these findings built upon each other and are complimentary (in other words, they converge) will provide answers to the research questions. Lastly the theoretical framework will be applied on these findings.

### 5.1 Perception of Campus Students on Use of Technology

The Meta-inference showed that technology can be used to achieve educational goals and can be adapted to suit any purpose. Using the UTAUT model developed by Venkatesh et al., (2003), and the IS continuance model, an investigation into the situation of campus students studying with only the use of technology was conducted to aid answering the questions regarding the use of technology. It touched upon performance expectancy, effort needed, fit for task and social factors that play significant roles towards the use of these technologies. UTAUT was used in combination with the IS continuance model. IS continuance model touched upon the future use of these technologies based on the experience of the students while using these tools (Lin, 2011), the outcome from using technology for their studies and the role satisfaction played towards their decision to adopt or drop the use of technology for future academic needs (Limayem and Cheung, 2008). With the lingering pandemic, what factors can influence the use of technology for all academic needs and post the pandemic too. IS continuance was used to accommodate for all positive and negative effects, as they are argued to be directly link to users' future decision to use or not use technology (Lin, 2011). These outcomes can help stakeholders prepare better or find better ways to see that negative surmountable issues are resolved, and a lot can be known about the behavior, attitudes and expectations of the students regarding the situation



and how they felt about using technology without choice to reach their academic goals. Also, it can help in evaluating the success of the systems in place and the technologies in use.

The meta-inferences that relate to the use of technology can be seen below.

1. The presence, prior experience and exposure to technological tools within the school made it easy to adopt these tools provided by the school for educational activities when the pandemic started
2. Convenience, reach (cutting across geographical boundaries) and flexibility are some of the benefits that comes with the use of technology for learning
3. The challenges faced were not major disruptions that even necessitated the need of IT support. These challenges were mostly on the student side, and they could solve them.
4. The use of technology for examinations, practical and workshops was adequate based on the responses and the experience of the respondents
5. Isolation, motivation and social interaction are still major issues that made the use of technology challenging as compared to traditional learning.
6. The lecturers were able to deliver their content to the best of their ability. They lacked in areas where it was difficult to identify students who clearly did not understand what was happening in class as they could not see the students been taught (according to the respondents most students consistently had their cameras turned off)
7. For use of technology in the future, majority preferred not to use technology, not because it was not effective, but because social interaction was lacking, and isolation was termed as a major issue. If they had to use technological tools, then it was hinged on conditions like if the pandemic lingered (since they remain safe), or totally on their own terms as it takes physical and mental readiness
8. Technological tools can be a good compliment to traditional learning methods. It made the world smaller by cutting eliminating geographical barriers and it has shown that guest lecturers can easily be accessed without having to be physically present. The students advocated for more of blended learning methods
9. Overall, the respondents were grateful that with technology they were able to meet their educational needs. For some, the pandemic brought an end to their studies, but for them, technology salvaged the issue. There were mixed feelings when it came to technology been regarded as a blessing or as a curse. They were thankful that technology was fit for task and aided them in achieving their learning objectives.

## 5.2 How have Students supported themselves during the disruptions?

The situation was simply seamless. The tools used were sufficient and effective enough. Even though they had access to the IT support and could run to them when they had issues, it was discovered that this situation never happened. Experience, ease of use of these technological tools made the



process easy and it made adopting technology smooth. Lin (2011) 'negative critical incidents' could impact on user's experience, ease of use and perceived assistance and usefulness in achieving their goal as the determinants to continuous use technology. This was not so much of the case here and the students had a smooth run. The continuous use of technology for learning between when the pandemic started was assessed by asking them if they would want to use it post-pandemic. These issues did not seem to discourage the users as the technologies themselves were effective and worked smoothly. The social issues, discomfort, isolation, needed to be explored as they are key antecedents to the continuous use of technology for learning as explained by Lin, (2011) were still present but this did not discourage them totally as they opined that they had no critical technical issues and will continue using technology but in a complimentary way within class learning.

But again, we see that the students did not stick to only the tools approved by the school or tools that they had access to use with their student credentials. They went ahead to use even social media platforms too based on perceived convenience, ability to get immediate responses and their collective presence on such platforms. Some of the tools used includes Facebook messenger, Google docs, WhatsApp and Skype. To the students, it was all about getting their academic goals and learning needs and thus they used the most effective as it suited their purpose at the time of need.



## 6 Conclusion

This research centered on gathering the perception of campus-based students that used technology for all their academic activities due to the coronavirus pandemic. It was important to get the insights into how students who registered for classroom learning (campus-based) and at most blended learning coped with the 100% use of technology. Learning mode changed when the health authorities began imposing restrictions. The mode of learning plays a role during student enrolment (Clarke, Nelson and Gallagher, 2020), and with the sudden change it was important to gather and seek to understand the opinion of students who had to use technology as the last resort to meet up with their academic needs and goals. These led to the research questions:

1. What is the perception of the on-campus students to the involuntary use of technology for all academic activities during the pandemic?
2. How have the students supported themselves with the use of technological tools to fulfil their learning needs, and what necessitated the use these tools?

To find answers to these research questions, a mixed method approach was used. A quantitative method of data gathering was done using online survey to see potential areas of interests, once the data was analyzed, the qualitative method followed to get deeper understanding of the situation from the students who used these technologies and what informed their decisions. These methods were applied sequentially and not concurrently. The quantitative data was analyzed by way of descriptive statistics and the data from the qualitative method was coded, categorized and concepts (themes) formed. Since the research was a mixed method, data from both methods were bridged and meta-inference formed. These meta-inferences were used to discuss the findings of this research and led to the answers to the research questions.

1. What is the perception of the on-campus students to the involuntary use of technology for all academic activities during the pandemic?

The study revealed that the students appreciated that they could use technology to continue their studies when the pandemic started, and restrictions came into effect. Technology was also effective for all their learning needs, it was easy to use, fit for their respective academic activities/purpose, and they were able to meet up with their academic needs. From the sample group interviewed, the participants had little or no technical challenges. Bulk of the issues centered on social issues, motivation, isolation, poor social interaction in the class, difficulty in understanding as compared to been in class and that it was easy to get distracted or lose focus while studying online. Regarding the use of technology for future purposes, the students interviewed all said no if they had the opportunity to decide what they wanted, else the use of technology would be conditional. They had no problems with incorporating technology with traditional lectures, but using technology alone in the future, they responded in the negative. Consensus centered on traditional classes where they could meet their



fellow classmates, interact and enjoy the other benefits that comes with technology, like convenience and flexibility.

2. How have the students supported themselves with the use of technological tools to fulfil their learning needs, and what necessitated the use these tools?

These students were conversant with technology either on a personal level or from using it in class. The issues they encountered was not sufficient to make them abandon a tool for another. The students supported themselves with social media tools and platforms and these acted as compliments to the existing tool provided by the school authority. These tools include social media apps like Facebook, WhatsApp, Skype, Google docs, etc. For them, the choice to use these tools was hinged on presence of other students on that platform, its convenience and response time and, it's fit for the task been done.

The UTAUT and IS continuance theories aided the formulation of the constructs by which the study was done. Without these theories and constructs, it would have been difficult to focus or narrow down the findings or use the collected data correctly. The findings showed that technology was easy to use, fit for use, effort expectancy and performance expectancy were not an issue, but social factors (motivation, isolation, lack of interaction, loss of concentration) were key determinants to their intention to retain or use technology 100% for their future academic needs.

There were mixed feelings of it been a blessing or a curse as it was necessary and useful in getting through their programs during the pandemic, but they could not wait to go back to their old way of learning (which was mostly traditional, but some had technology infused because they had joint classes with distance students).

## 6.1 Research Contribution

This research sought to understand the role of technology in learning institutions. It was different because it considered the use of technology not as an option, but as the only means of delivering and receiving academic activities. The attitudes of the students towards its use were welcoming as they had no other alternatives, but there are still issues that needs to be addressed.

By using a mixed method approach, the qualitative method sought to explain the findings of the survey sent out to a wider sample population. Irrespective of how effective technology was to satisfy the students learning needs, social factors play a great role towards retention and voluntary use of technology for future academic activities. One might argue, there are distance students already. This study shows that more people can opt for distance courses and use of technology if these social issues can be surmounted. One thing to note is that the applicability of technology for every discipline might not be known from this study as none of the interview participant had a fully hands on course or program. The availability of technological resources also played a great role towards the way and how quick the students embraced technology. This could have impacted on the readiness of the university to



switch to online study mode when it became inevitable. So, for academic institutions without these technologies in place already, an unplanned disruption might hit them hard. Finally, this research has shown how students related with technology for educational needs and it can help stakeholders catch a glimpse of students experience with technology for learning the pandemic.

## 6.2 Areas for Future Research

This study was conducted in Sweden, where students are exposed to technologies in one form or the other even from an early stage. An area for future research, will be accessing the perceptions of students in countries in the global south, or where the power of technologies is yet to be harnessed fully to support educational needs of students and researchers.

It would be good to try this research on students studying purely applied sciences like Chemistry, Engineering, computer science, mathematics, and even health related courses. Doing this would inform our opinion on how effective technology can be used for every field of study.

No generalization was made too because the sample size was very little. It will be interesting to conduct this research with a wider sample of students to get a robust opinion that can aid making a more informed decision or even generalization. This can be across departments/faculties or even within just a department.

More research can be done relating to how social issues like motivation, isolation, poor social interaction in the class can be managed and better improved. These are issues that greatly impact on the student's choice of wanting to use technology long term.

In this study, the focus was not on any specific technological tool. It will be beneficial to see a study in this regard with the use of a particular tool or technology (e.g., Zoom, Skype, Facebook, WhatsApp, etc.) and students' perceptions about it. These are areas that can lead to greater knowledge about the use of technology both formal and informal for academic activities.



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## Appendix A. Questionnaire for Online Survey

### Unplanned disruptions: The perception of campus students to the involuntary use of Information technology.

Hello!!!

This is a survey aimed at gathering the perception of students on the involuntary use of technology during the pandemic for all academic activities. I am a master's student in Information Systems with Linnæus University (Växjö, Sweden) and would love to get these responses to enable me to complete my thesis.

I would be glad if I can get 3 to 5mins of your time to answer these questions. Every information provided will be treated confidentially and in accordance with GDPR. No personal details will be collected, and every other information collected will be used accordingly and for solely the purpose of this research.

Thank you.

---

**\*Required**

How old are you?

Enter answer

---

What is your gender? \*

- ☐ Female
- ☐ Male
- ☐ Prefer not to say

For how long have you been studying?

Enter answer

---

Are you a student registered to study for campus studies (in-class learning)?  
(If no, please do not proceed with the survey) \*

Yes ☐

No ☐



Indicate your faculty \*

*Tick all that apply.*

- ☐ Business and Economics
- ☐ Technology and Engineering
- Arts ☐
- ☐ Natural sciences
- ☐ Social and Behavioural sciences
- ☐ Computer Science/IT
- ☐ Other

Are you an undergraduate or postgraduate student? \*

☐ Undergraduate

☐☐

Postgraduate

Other:

---

Are you an international student or a student resident in Sweden? \*

☐ International Student

☐ Resident in Sweden

Before the pandemic, did you use any digital technologies or tools for your academic activities? \*

Yes ☐

No ☐

How often did you use digital tools for academic activities? \*

☐ Very often

☐ Sometimes

☐ Never



Did the school provide you with digital tools and technologies for academic activities when studies migrated online? \*

Yes ☐

No ☐

Did you use other digital tools to collaborate with your fellow students?

Yes ☐

No ☐

☐ Maybe

Did you have any challenges while using these tools and technologies? \*

Yes ☐

No ☐

Can't ☐ say

Did you get adequate I.T support when you encountered challenges? \*

Yes ☐

No ☐

☐ Somehow

Did you have any course that required practical, lab sessions or workshops? \*

Yes ☐

No ☐

How did it go with the use of technological tools for practical, lab sessions and workshops? \*

1	2	3	4	5	
Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

Did you do any examination with the use of digital tools? \*

Yes ☐

No ☐



How did it go with the use of technological tools for examinations? \*

1	2	3	4	5	
Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

How satisfied are you with the social interaction in the class during online learning? \*

1	2	3	4	5	
Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

How satisfied are you with the lecturer's delivery/communication during the online teaching mode? \*

1	2	3	4	5	
Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

Did you feel any form of isolation or disconnection from the activities in the class or with your colleagues? \*

Yes ☐

No ☐

☐ Maybe

Do you agree that online mode of learning can be used for all courses/programs? \*

1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

How convenient was the use of technology in satisfying your learning needs? \*

1	2	3	4	5	
Very inconvenient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very convenient

Was migrating online a blessing in disguise or a curse? \*



It was ☐ a blessing in disguise

It felt ☐ like an unavoidable curse

Not ☐ sure

Based on your experience now, would you prefer the use of technology for the rest of your academic studies (current educational program)? \*

Yes ☐

No ☐

In the nearest future would you choose to register for programs delivered online or you would rather the traditional mode of learning? \*

☐ Online programs

☐ Traditional mode of learning (On-site)

Don't ☐ know

What mode of learning do you think is the best? \*

☐

☐

☐

Traditional

Blended

Online

For any other comments or if you would like to be contacted to further elaborate on your responses (via an interview), kindly leave your email address below and I will get back to you. Or kindly reach out to me through this email [oa222hy@student.lnu.se](mailto:oa222hy@student.lnu.se)





## Appendix B. Interview Question

### Introduction:

This is an interview aimed at gathering the perception of students on the involuntary use of technology during the pandemic for all academic activities. I am a master's students in Information Systems with Linnæus and would love to get these responses to enable me to complete my master thesis. I would be glad if I can get 30 to 45mins of your time to answer these questions. By answering these questions, you provide consent to use this information for research purposes. Every information provided will be treated confidentially and in accordance with GDPR. No personal details will be collected or revealed, and every other information will be used accordingly and for solely the purpose of this research.

### ***Section A. Background***

- Q. For how long have you been studying in your university/Högskolan?
- Q. Are you a registered campus student?
- Q. Do you still live on campus, or you now live elsewhere even as you study through the pandemic?
- Q. What is your faculty (Business and Economics / Technology / arts / natural sciences, etc)
- Q. Are you an undergraduate or postgraduate student?
- Q. Are you an international student or a student permanently resident in Sweden (native\*)?

### ***Section B. Learning experience***

- Q. Before the pandemic, did you use any digital technologies or tools for your academic activities? What tools did you use?
- Q. What new tools or technologies have you been using for your academic activities since the university migrated to online learning (during the pandemic) and did the school provide you with these tools?
- Q. During the migration and while learning on the online mode, what IT support did your university provide and how adequate were they in attending to issues that occurred?
- Q. Are there any other tools or technologies you have used for collaboration with your fellow students or teachers other than the one provided by the school?
- Q. Did you experience any difficulties with these tools the university provided and what kind of difficulties? [Past tense because it considers the situation from the start of the pandemic to this moment when the research is being conducted]
- Q. Were you able to use the technological tools for lectures, examinations and how effective were they for all your learning activities? If no, kindly state areas you felt it was insufficient.



Q. Did you have any practical course that required practical, lab sessions or workshops and how did it work with the use of technological tools?

Q. If you had to choose the mode of learning, would you prefer the use of technology for the rest of your education? What are some of the benefits you enjoyed from this mode of learning? (*Benefits of the respondent's choice of study*)

Q. Were there other issues non-academic issues, social or non-technical, that you had while studying via only the online mode of learning?

Q. Did you have issues with motivation while studying via the online mode? Can you explain with examples if possible?

### ***Section C. Perception and satisfaction***

Q. What was your old learning system like?

Q. Do you wish to go back to the old system of learning pre-corona situation? If yes or no, state why.

Q. What is your perception about general discussions in the online class vs the former way of learning?

Q. If you are to choose between online, blended, and traditional learning modes, which would you prefer? Why?

Q. Do you see yourself registering for more online courses and programs in the nearest future? If yes or no, state why.

Q. Has this mode of learning been “a blessing in disguise” (*something you wish you had known or utilized before now that would be of great benefits*) or “a curse” (*something you just cannot wait to pass and be over with*)?

Q. Do you look forward to online classes or just wish it would end already?

Q. Did you feel any form of isolation at any point, or did you feel socially connected to the teachers and other students?

Q. How satisfied are you with the social interaction in the class during online learning? What led to this satisfaction or otherwise?

Q. How satisfied were you with the lecturer's delivery/communication during this mode of learning? And what

Q. How convenient was the use of technology in satisfying your learning needs? Please clarify or explain more

Q. What is your opinion on the use of online mode of learning for all courses/programs?

Q. Generally how satisfied are you with the involuntary use of technology in meeting your learning needs?

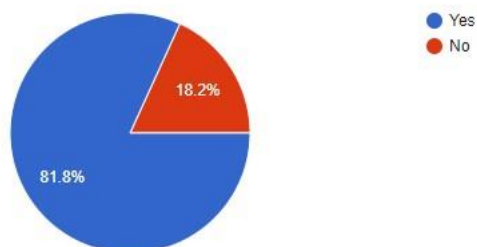
Q. Are there any other comments



## Appendix C. Survey Summary

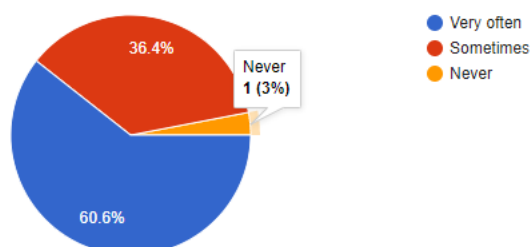
Before the pandemic, did you use any digital technologies or tools for your academic activities?

33 responses



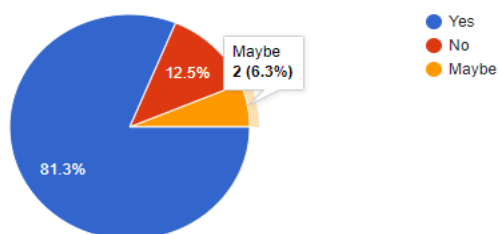
How often did you use digital tools for academic activities?

33 responses



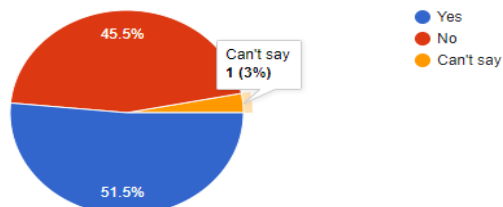
Did you use other digital tools to collaborate with your fellow students?

32 responses



Did you have any challenges while using these tools and technologies?

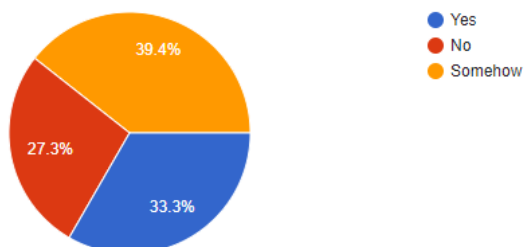
33 responses





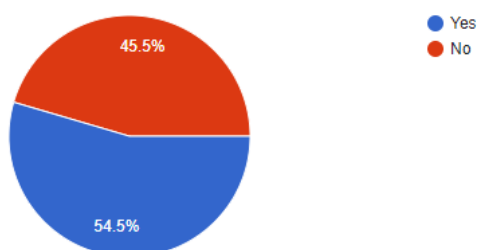
Did you get adequate I.T support when you encountered challenges?

33 responses



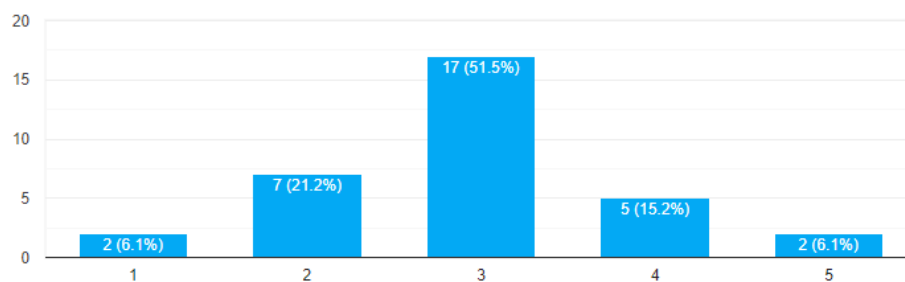
Did you have any course that required practical, lab sessions or workshops?

33 responses



How did it go with the use of technological tools for practical, lab sessions and workshops?

33 responses

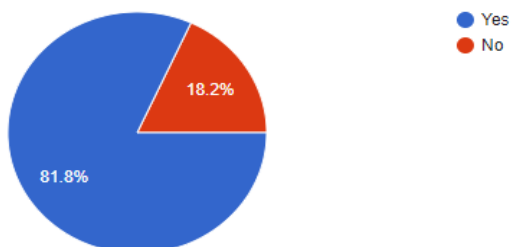


This linear chart ranked from 1 to 5 – very unsatisfied to very satisfied.



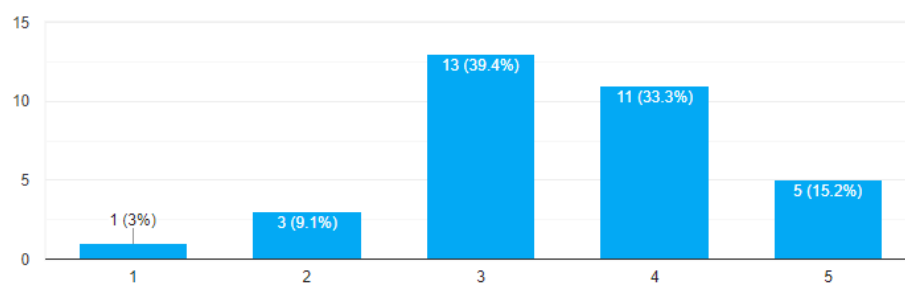
Did you do any examination with the use of digital tools?

33 responses



How did it go with the use of technological tools for examinations?

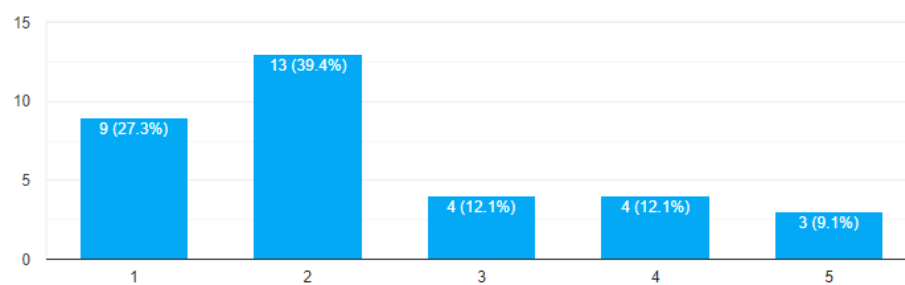
33 responses



This linear chart ranked from 1 to 5 – very unsatisfied to very satisfied

How satisfied are you with the social interaction in the class during online learning?

33 responses

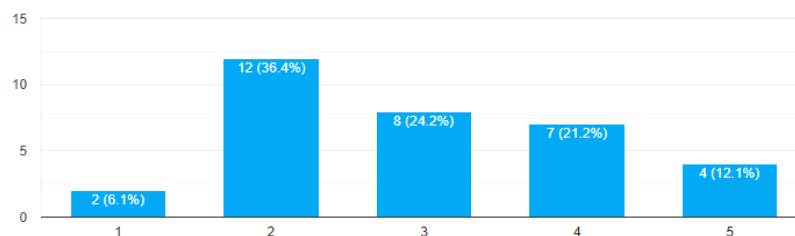




How satisfied are you with the lecturers delivery/communication during the online teaching mode

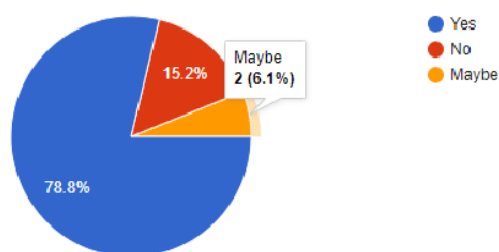


33 responses



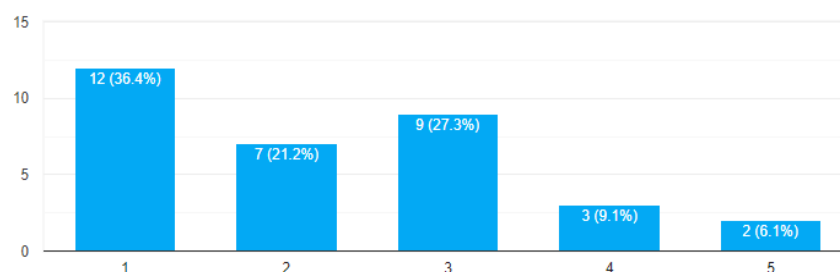
Did you feel any form of isolation or disconnection from the activities in the class or with your colleagues?

33 responses



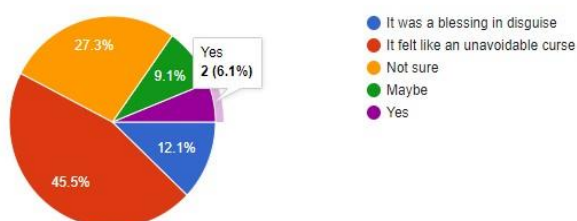
Do you agree that online mode of learning can be used for all courses/programs?

33 responses



Was migrating online a blessing in disguise or a curse?

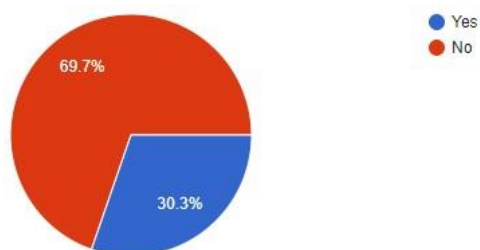
33 responses





Based on your experience now, would you prefer the use of technology for the rest of your academic studies (current educational program)?

33 responses



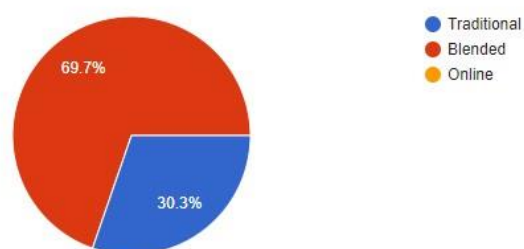
In the nearest future would you choose to register for programs delivered online or you would rather the traditional mode of learning?

33 responses



What mode of learning do you think is the best?

33 responses





## Appendix D. Informed Consent Form

**Consent form for taking part in (Title: Unplanned disruptions: The perception of campus students on the 100% (Involuntary) use of information technology.**

This is a survey aimed at gathering the perception of students on the involuntary use of technology during the pandemic for all academic activities. It is a master's thesis in Information Systems with Linnaeus University (Växjö, Sweden) and your responses will enable me to complete it. I would be glad if I can get 30mins of your time to answer questions relating to this study. Every information provided will be treated confidentially and in accordance with GDPR.

By signing this consent form, you approve that your personal data is processed within the frame of the thesis/study described above. You can withdraw your consent at any time by contacting one of the contact persons below. In that case, your personal data will not be saved or processed any longer without other lawful basis.

No personal data will be collected or needed from you.

You always have the right to request information about what has been registered about you and to comment on the processing of the data that has been collected by contacting one of the contact persons below or the higher education institution's personal data ombudsman on [dataskyddsbud@lnu.se](mailto:dataskyddsbud@lnu.se). Complaints that cannot be solved in dialogue with Linnaeus University can be sent to the Swedish Authority for Privacy Protection.

.....  
Signature

.....  
City and date

.....  
Name in block letters

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