

**Information Needs and Information-seeking Behaviour: A Case of
University Students**

By

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Declaration

I declare that *Information needs and Information-seeking behaviour: A case of university students* is my own work and that all the sources that I have used or quoted have been indicated and acknowledged using complete references.

Signed:

Date: 22 March 2022

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Dedication

To my wonderful wife, Mrs Joan-Ark Manu Agyapong and my lovely children, Kabod Okatakyie Manu Agyapong and Lael Odehye Manu Agyapong.

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List of acronyms

ICT: Information and Communication Technology

UCC: University of Cape Coast

IT: Information Technology

MOE: Ministry of Education

GES: Ghana Education Service

DBMS: Database management system

ISP: Information Search Process

CAS: Current Awareness Services

SDI: Selective Dissemination of Information

IR: Information Retrieval

Abstract

This study was conducted to explore the information needs and information-seeking behaviours of students at the University of Cape Coast (UCC) in Ghana. Seven objectives were addressed. The study adopted an explanatory mixed method design where a quantitative sample was 366 students from a population of 6000 students. The qualitative part of the study employed a purposive sampling technique to select five students and five librarians for interviews. Quantitative data were subjected to descriptive analysis and inferential statistics, while qualitative data analysis followed conventional procedures according to Leedy and Ormrod (2001). The study yielded the following findings according to the objectives: Objective 1: Academic information is the basic information need of undergraduate students at UCC. Objective 2: Internet sources and electronic media are the main sources of information for students. Moreover, the results showed that discussions with colleagues, lecturers and teaching assistant are information resources utilised by students. Objective 3: Most students use ICT resources to search for information. These ICT resources include the use of computers and mobile phone internet service to search for academically relevant. Objective 4: The ICT resources available for students are adequate and effective. However, some did not find these ICT resources effective. Objective 5: Gender affects the information-seeking behaviour of student. In addition, the results show that age affects computer skills of students and the academic level of students affect library resource usage. Objective 6: The use of library resources has an influences on computer skills and information-seeking behaviour of students. Objective 7: The continuous and periodic training of students on computer skills can help improve the satisfaction of students' information needs and information-seeking behaviour. The findings demonstrated that ICT resources are adequate for meeting the students' information needs. The study revealed that the information-seeking behaviour of the students was partly influenced by the relationship which exist between them and the ICT laboratory and library staff. At a theoretical level, the research provided insights into the different concepts and theoretical models of information-seeking behaviour. It also deepened the understanding of different strategies employed by university students on campus. At an empirical level, the new knowledge and insights derived from the results add to a broader perspective on the interrelationships between the information-seeking behaviour and information needs of students. This study has also added to the body of knowledge on how information resources could be enhanced in the learning environments. The study recommended that the level of automation of the library should be improved alongside the provision of adequate and updated study materials to encourage the students' patronage of the

facility. The study was limited to the Faculty of Education students; therefore, the findings may not be generalised to all UCC students.

Keywords: Information-seeking, information-seeking behaviour, information communication technology, information needs, information

Tshobokanyo

Thutopatlisiso e diretswe go tlhotlhomisa ditlhokego tsa tshedimosetso le mekgwa ya go batla tshedimosetso ya baithuti kwa Yunibesithi ya Lebopo la Kapa (UCC) kwa Ghana. Go samaganwe le maikemisetso a le supa. Thutopatlisiso e dirisitse thadiso ya mokgwa o o tswakaneng wa tlhaloso, go dirisiwa sampole e e lebelelang dipalopalo ya baithuti ba le 366 go tswa mo setlhophaselong sa baithuti ba le 6000. Karolo e e lebelelang mabaka ya thutopatlisiso e dirisitse thekeniki ya go tlhopha sampole go ya ka maitlthomo a patlisiso go tlhopha baithuti ba le batlhano le balaeborari ba le batlhano go botsolodiwa dipotso. Go dirisitswe tokololo e e tlhalosang le dipalopalo tsa kakaretso mo dateng ya dipalopalo, fa tokololo ya *data* e e lebelelang mabaka e dirisitse dithulaganyo tsa tlwaelo go ya ka Leedy le Ormrod (2001). Thutopatlisiso e tlhagisitse diphitlhelelo tse di latelang go ya ka maikemisetso:

Maikemisetso 1: Tshedimosetso ya dithuto ke tlhokego ya motheo ya tshedimosetso ya baithuti ba dithuto tsa pele ga kalogo kwa UCC. Maikemisetso 2: Metswedi ya inthanete le bobegakang jwa elektoroniki ke metswedimegolo ya tshedimosetso ya baithuti. Dipholo di bontshitse gore dipuisano le baithutimmogo, batlhatheledi le bathusabarutabana ke metswedi ya tlaleletso ya tshedimosetso e e dirisiwang ke baithuti. Maikemisetso 3: Bontsi jwa baithuti bo dirisa ditlamelo tsa ICT go batla tshedimosetso. Metswedi eno e akaretsa tiriso ya dikhomphiutha le ditirelo tsa inthanete tsa difounu go batla tshedimosetso e e maleba mo dithutong. Maikemisetso 4: Ditlamelo tsa ICT tse baithuti ba kgonang go di fitlhelela di lekane e bile di bokgoni, le fa ba bangwe ba sa bone ditlamelo tseno di le bokgoni. Maikemisetso 5: Bong bo ama mekgwa ya go batla tshedimosetso ya baithuti. Go tlaleletsa, dipholo di bontsha gore dingwaga di ama dikgono tsa khomphiutha tsa baithuti mme le seelo sa dithuto sa baithuti se ama tiriso ya ditlamelo tsa laeborari. Maikemisetso 6: Tiriso ya ditlamelo tsa laeborari e na le tlhotlheletso mo dikgonong tsa dikhomphiutha le mekgwa ya go batla tshedimosetso ya baithuti. Maikemisetso 7: Katiso e e tswelelang le ya gangwe le gape ya baithuti ya dikgono tsa dikhomphiutha e ka thusa go tokafatsa go kgotsofadiwa ga ditlhokego tsa baithuti tsa tshedimosetso le mekgwa ya go batla tshedimosetso. Ka kakaretso, diphitlhelelo di bontshitse gore ditlamelo tsa ICT di lekane go ka fitlhelela ditlhokego tsa baithuti tsa tshedimosetso. Thutopatlisiso e senotse gore mekgwa ya go batla tshedimosetso ya baithuti e tlhotlhelediwa ka bontlhabongwe ke kamano e e gona magareng ga bona le badiri ba ICT, laboratori le laeborari. Mo legatong la tiori, patlisiso e bontshitse megopolo e e farologaneng le dikao tsa tiori tsa mekgwa ya go batla tshedimosetso. Gape e tiisitse go tlhalogannngwa ga ditogamaano tse di farologaneng tse di dirisiwang ke baithuti ba yunibesithi mo khemphaseng. Mo legatong la maitemogelo, kitso e ntšhwa le ditemogo tse di tswang mo dipholong di tlaleletsa mo

megopolong ka bophara e e malebana le dikamano magareng ga mekgwa ya go batla tshedimosetso le ditlhokego tsa tshedimosetso tsa baithuti. Thutopatlisiso eno gape e tlaleleditse mo kitsong e e ka ga ka moo go ka tokafadiwang ditlamelo tsa tshedimosetso ka gona mo ditokologong tsa go ithuta. Mmatlisisi o atlenegisa gore seelo sa tiriso ya thekenoloji mo laaborari se tokafadiwe, mme go nne le tlamelolo ya dimatheriale tsa go ithuta tse di lekaneng e bile di ntšhwafaditswe, go rotloetsa baithuti go e dirisa. Thutopatlisiso e ne e lebeletse fela baithuti ba Lefapha la Thuto; ka jalo, diphitlhelelo di ka se ke tsa akaretsa baithuti botlhe ba UCC.

Mafoko a botlhokwa: go batla tshedimosetso, mekgwa ya go batla tshedimosetso, thekenoloji ya tlhaeletsano ya tshedimosetso, ditlhokego tsa tshedimosetso, tshedimosetso

Ingqikithi Yocwaningo

Lolu cwano lwenziwa ukuba luhlale okudingekayo uma kufunwa ulwazi kanye nezindlela zokufuna ulwazi zabafundi base-University of Cape Coast (i-UCC) eGhana. Kwadingidwa izimpokophelo eziyisikhombisa. Lolwano cwano lwasebenzisa indlela engxube yokwenza ucwano, lwasebenzisa amasampula ezibalo zabafundi abawu-366 abathathwe enanini labafundi abawu-6000. Ingxanye elandisayo yocwano yasebenzisa ukwenza amasampula ngenhloso ethile ukuze kuhlunge abafundi abahlanu kanye nabasebenzi bomtapowolwazi abahlanu ukuze kube nezinkulumongxoxo nabo. Ulwazi olungahlungiwe olusebenzisa izibalo lwabe selusetshenziswa ukuba kuhlaziye ngendlela elandisayo kanye neyezibalo eziqondisayo, kanti uhlaziyo lolwazi olungahluziwe olulandisayo lwalandela izinqubo ezejwayelekile ngokusho kuka-Leedy no-Ormrod (2001). Ngokwezimpokophelo lolwano cwano lwathola le miphumela elandelayo: Impokophelo yoku-1: Ulwazi olumayelana nokufunda luyisidingo esiyisisekelo kubafundi abenza amaqhuzu okuqala e-UCC. Impokophelo yesi-2: Imithombo ye-intanethi kanye nemithombo yezokwazisa esebenzisa ubuchwepheshe besimanjemanje iyona mithombo eqavile yolwazi kubafundi. Imiphumela ikhombise ukuthi izingxoxo nabalingani, othisha kanye nabalekeleli bezokufundisa bayizingqalasizinda zolwazi ezengeziwe ezitshenziswa ngabafundi. Impokophelo yesi-3: Abafundi abaningi basebenzisa izingqalasizinda ze-ICT ukuze bahlwaye ulwazi. Lezi zingqalasizinda zibandakanya ukusetshenziswa kwamakhompuyutha nezinsizakalo ze-intanethi yamaselula ngenhloso yokuhlwaya ulwazi olusemqoka ekufundeni. Impokophelo yesi-4: Izingqalasizinda ze-ICT ezikhona kubafundi zanele futhi ziyasebenza, nakuba abanye babo baveza ukuthi lezi zingqalasizinda azisebenzi. Impokophelo yesi-5: Ubulili buyayithinta indlela yabafundi yokufuna ulwazi. Ukwengeza nje, imiphumela ikhomba ukuthi iminyaka inomthelela ekusebenziseni izingqalasizinda zomtapo wolwazi. Impokophelo yesi-6: Izingqalasizinda, ekugcineni, zinomthelelela kumakhono ezekhompyutha kanye nasezindleleni zabafundi zokufuna ulwazi. Impokophelo yesi-7: Uqeqesho oluqhubekayo nolwangezikhathi ezithile kubafundi lungasiza ekwenzeni ngcono ukuba abafundi bagculiseke ngezidingo zokuthola ulwazi kanye nezindlela zokufuna ulwazi. Isiyonke, imiphumela ikhombe ukuthi izingqalasizinda ze-ICT zanele ukuba zihlangabezane nezidingo zabafundi zokuthola ulwazi. Ucwano luveze ukuthi izindlela zabafundi zokufuna ulwazi ziphazanyiswa kancane wubudlelwane obukhona phakathi kwabo namagumbi e-ICT kanye nabasebenzi bomtapowolwazi. Ezingeni le njulalwazi, lolwano cwano luhlinzeke isithombe esithile mayelana namagama ahlukeneyo kanye nemifanekiso yenjulalwazi yezindlela zokufuna ulwazi. Luphinde lwajulisa kakhulu ukuqonda amaqhingu ahlukeneyo asetshenziswa ngabafundi

benyuvesi ekhempasini. Ezingeni elingasebenzisi isayensi kodwa elisebenzisa ukulinga nokubona, ulwazi olusha kanye nokupendeka kwesithombe esithile okuvelile emiphumeleni kwengeza embonweni obanzi omayelana nobudlelwano obuphakathi kwezinto ezimbili okuyizindlela zokufuna ulwazi kanye nezidingo zolwazi zabafundi. Lolu cwaningo luphinde lwangeza ulwazi olumayelana nokuthi izingqalasisinda zolwazi zingakhuliswa kanjani ezindaweni zokufunda. Umcwangingi uncoma ukuba izinga lokuzenzekalela kwezinto emtatshweni wolwazi lenziwe ngcono, luhambisane nokuhlinzekwa ngezinto zokufunda ezanele futhi ezintsha ukuze kukhuthazwe isithunzi sabafundi ngale ndawo. Lolu cwaningo lwenziwa kubafundi beFakhathi Yezemfundo kuphela; ngakho-ke, imiphumela ngeke ithathwe ngokuthi ibabopha ngabhande linye bonke abafundi base-UCC.

Amagama asemqoka: Ukufuna ulwazi, yizindlela zokufuna ulwazi, ezobuchwepheshe bolwazi lwezokuxhumana, yizidingo zokuxhumana, wulwazi

Chapter One

Orientation into the study

1.1 Introduction

In recent years, there has been a phenomenal growth in the use of information technology, computer network and communication technology (Ghosh, Abraham, Palvia & Nemati, 2020). According to Wang, Liu and Parker (2020), during the past decade there has been an exponential growth in the use of Information Communication Technology (ICT), which has made a pervasive impact both on society and on peoples' lives. Furthermore, most universities make use of ICT tools to generate, disseminate, communicate and manage information, which has greatly enhanced the structure of teaching and learning (Alkamel & Chouthaiwale, 2018). Mailizar and Fan (2020) explain that ICT has the possibility to transmute the nature and process of teaching and learning atmosphere and foresee a new learning culture.

Moreover, the impact of ICT has been much felt in education over the years with regard to retrieval and dissemination of information (Genlott, Grönlund & Viberg, 2019). According to Ugwu and Nnaekwe (2019), the increase of these communication and computer systems, with their easy utilization, the influence and multiplicity of information transfer enable students to have entrance to a domain beyond the classroom. Moreover, libraries, which serve as information finding places have found themselves caught up in an ICT driven world (John & Balasubramanian, 2019). To actively play or execute their roles well to satisfy user needs, libraries have no other choice than to increase their efficiency and effectiveness thus, they ought to adventure ICT to enhance quality services (Genlott et al., 2019).

Matters of concern such as sufficiency and deployment of ICTs in the universities as well as the provision and establishment of the same in academic environments have received much popularity over the years (Habib, Jamal, Khalil & Khan, 2021). Drawing from the discussion so far, it can be seen that much has been done but more can still be done to fill the knowledge gap considering the information needs of the education students in most universities (Genlott et al., 2019; Ugwu & Nnaekwe 2019; Ghosh et al., 2020; Mailizar & Fan 2020). As such, this study explored the information needs and information-seeking behaviour of education students with respect to their

exploitation of ICT laboratories and library facilities with the intention of making recommendations to promote sound learning and research.

The introductory chapter gives the background to the study by creating a justification for the relevance of the study and provides the research problem for the study. It also covers the rationale and aims of the research, as well as a brief discussion of the research methodology and key definitions of terms used. The chapter division of this study has also been clarified.

1.2 Background to the study

In this millennium era, knowledge, information and data cannot be downplayed due to their relevance and now they have been considered as very basic to the survival of humankind (Setyahuni & Handayani, 2020). According to David-West (2020), the success and survival of various communities, organisations, groups and individuals highly depends on their ability to retrieve, choose, access, process and use information to the maximum level. Furthermore, information as an idea or concept is not novel in library information science; its presence is made in such a way to analytically solve problems anytime it is needed and required by people daily (Makinde, Jiyane & Mugwisi, 2020). Therefore, Roetzel (2019) posits that, individuals in the world need and seek information to continue to stay alive in this information age be it skilled or trained people, educationists and researchers for the successful execution of day-to-day activities.

University students from different disciplines across the globe are not an exception in the prevailing desire for information for their countless assignments, project work and examinations (Bright & Asare, 2019). Banjoko, Ifabiyi, Ahmed, Lawal, Isiaka and Awarun (2020) argue that the need for information comes about when a person identifies that his or her present state of knowledge and understanding is not sufficient to deal with issues and assignments, to resolve problems creatively or close a gap in a particular field or discipline. In the same way, Greenzang, Fasciano, Black and Mack (2020) mention that information needs can be interpreted as a recognised knowledge gap that a user yearns to resolve or close. In addition, Wilson (1981) points out that when we say something regarding users and their information need, we should think of information as a means to an end of meeting such fundamental wants, rather than as a fundamental, intrinsic, cognitive or emotional need for information. He goes on to say that in the quest of searching for information to satisfy a person's need, he or she may be involved in information-seeking behaviour. The search for information by users in the education field has changed overtime

due to the introduction of information technology (Qaddumi, Bartram & Qashmar, 2021) and this is because education across the globe has experienced some changes (Weber, Becker & Hillmert, 2019) which now affect the way students worldwide seek information.

Due to the aforementioned changes, there is an urgent need for students to acquire the requisite and novel skills and ideas to strategically cope with the current trends of the integration of computers and communication in the education system (Howlader & Islam, 2019). Furthermore, due to the vast spread of Information and Communication Technology (ICT) in this new age, the transfer of knowledge has somehow shifted from teacher to be learner-focused (Hernandez, 2017). Hence, the need for ICT has become very crucial in various Higher Educational Institutions (HEI) due to its positive effect on both the students and the management of institutions (Agrawal & Mittal, 2018). Similarly, Carrion-Martinez, Luque-de la Rosa, Fernandez-Cerero and Montenegro-Rueda (2020) assert that ICT enhances the growth of different methods and forms of student learning which changes the quality and effectiveness of people's life. According to Pradhan, Mallik and Bagchi (2018), ICT is the combination of both information and technology (IT) and communication technology (CT). Among several definitions, Ratheeswari (2018) explains ICT as the technologies that offer opportunities to get quality information by using telecommunication. Semerci and Aydin (2018) define ICT as the method used in information handling and processing. It encompasses the processing and distribution of data using computer hardware and software, telecommunications and digital electronics.

On a daily basis, the use of information spreads in every aspect of life creating huge impact in the daily rituals of individuals (Arkorful, Barfi & Aboagye, 2021). Moreover, not disputing the use of information, the reliance on ICTs and other services has enhanced their accessibility and have been key to the revolutionary changes in most parts of the world and the individuals' everyday life. According to Picatoste, Pérez-Ortiz and Ruesga-Benito (2018), in the past years there has been an exponential rise in the patronage of ICT, which has made a huge impact on both society and peoples' lives. They add that, relevance of this impact has been much realised in education. Therefore, it is admissible that an efficient teaching-learning processes in universities is quite attainable, especially with its impact in developing and enhancing the required skills and abilities for this modern world (Adindu, 2020).

However, there is a significant knowledge gap when it comes to the demand of information and seeking behaviour of tertiary students, particularly education students (Genlott et al., 2019; Ugwu

& Nnaekwe 2019; Ghosh et al., 2020; Mailizar & Fan 2020). Issues such as sufficiency and deployment of ICTs in the universities as well as the provision and establishment of the same in academic environments have received some attention over the years (Hashmi, et al., 2019). This study explored the information needs and information-seeking behaviour of students with respect to their exploitation of ICT laboratories and library facilities with the intention of making recommendations to promote sound learning and research.

Studies have been conducted on information needs and information-seeking behaviour. There has been research conducted on the information needs of people from various backgrounds and professions over the years. Software practitioners (Josyula, 2016), librarians (Alazemi, 2015) and engineers are among the occupations whose information needs have been investigated (Du Preez, 2015). Again, Makinde, Jiyane and Mugwisi (2021) citing Azelea and Hundu (2016) in their study of the National Veterinary Research Institute in Nigeria, discovered that scientists needed information for research (91.3%), conference papers (78.3%), communicating ideas (67.4%), updating knowledge (45%), new projects (38%), establishing facts (23%), current awareness (21%), lecturing (18%) and decision-making (17%). It can be deduced that information is needed in all aspects of life (Arthur, Dukper & Bawa, 2019; Azlea & Hundu, 2016). Moreover, Makinde (2018) cites Okonoko, Njideka and Mazah (2015), who examined the challenges associated with the information-seeking behaviour of researchers in Nigerian libraries such as information being scattered in too many sources, which is a pointer to the challenge of information explosion resulting from the 'adoption' or recent gigantic advancements in the field of ICT. These explain that studies have been on other sectors, but little have been considering students. This further motivated the reason why this study seeks to focus on university studies.

1.2.1 Information needs of university students

Information needs can be thought of as a personal or collective aspiration to find and acquire information to fulfil a conscious or unconscious need (Ismaila, 2019). According to Banjoko et al. (2020), information needs should be understood and anticipated to give the right and relevant information. Furthermore, information needs relate to the kind of information needed, steps that can be taken to satisfy the need, grounds on which information should be provided, and the extent of detail to be given (Makinde, et al., 2021). Information needs are extremely individualised and depend on the educational level of the user, the capability to verbalise requirements, readiness to study and most importantly, the tendency to effectively use the information acquired (Delaney & Bates, 2018). Naveed and Suhaib (2019) posit that it is vital to determine and assess the

information needs of a specific group, in this context student, when making decisions about what information ought to be incorporated or provided to address the distinctive needs of users.

1.2.2 Information-seeking behaviour of university students

Knowledge-drivenness is the foundation of higher educational institutions across the globe which is heavily dependent on information (Razi, Habibullah & Hussin, 2019). Therefore, it is very critical for one to know how to access information. Furthermore, information-seeking behaviour could be explained as the mode and means individuals look for and apply information for their use, and updating and developing knowledge (Howlader & Islam, 2019). In other words, it is the act and behaviour that opens access to information, data and knowledge utilisation and dissemination. Additionally, information-seeking behaviour is the purposive seeking for information because of a need to satisfy some goals (Thindwa, Chawinga & Dube, 2019).

Thindwa, Chawinga and Dube (2019) mention that people use both manual and computer-based information systems to satisfy their information needs. The individual consults various sources to meet those needs. The availability of information is important but its use by students is the most important since that is the only way the information will transform into knowledge (Tofi, 2019). The library is one major information source for students (Otunla & Olajide, 2020). Otunla and Olajide (2020) add that the library staff must therefore be aware of the information that is needed by its customers and how it can be acquired. This will aid the library to provide resourceful services and project itself as the main information provider for students' research and course work (Anyim, 2019).

1.2.3 Information communication technology in education in Ghana

Technology has in a way turned out to be the mother of most of the discoveries and innovations as it touches almost every face of human life from manufacturing and consumption and waste disposing (Adamu, Umar, Umaru & Dokoro, 2020). In addition, for Ghana to improve its ability to achieve fundamental and workable conditions, there have been huge funds and policies drafted to assist the country to employ technology for its economic growth. As a result, according to Gyaase, Gyamfi, Kuranchie and Koomson (2020), the Ministry of Education has put in immense effort to integrate ICT into the Ghanaian education system primarily through Ghana Education Service (GES), some private agencies and other development partners. Therefore, great effort has been chiefly focused on the distribution of some ICT facilities such as the creation of ICT work rooms and delivery of computers in most of the pre-tertiary and tertiary institutions (Arkorful,

Barfi & Aboagye, 2021). This has in a way brought about a phenomenal change and a sudden increase of ICT in contemporary societies which influenced the demands of the current civilisation. It is connoting the relevance of ICTs which plays a vital role in the progression of most countries (Adamu, Umar, Umaru & Dokoro, 2020). According to Suarez, Almerich and Orellana y Diaz (2018), there have been an enormous accessibility of worldwide resources such as libraries where academics, professionals and students can access and link to each other in research anytime and everywhere. Moreover, there is a rising demand on institutions to use ICTs in their learning and teaching to enable students to fit equitably into the present job market (Younus & Sajjad, 2020). The usage of computer technologies in education can enhance teaching and learning and increase the skills and abilities of users. Due to the aforementioned, ICT usage by students in Ghana, especially in the urban areas, is on the rise (Owusu-Ansah, Rodrigues & Van Der Walt, 2018). Nevertheless, it seems its associated positive effects on academic work has not been adequately felt. This situation necessitated a number of ICT in education initiatives in the country.

In Africa, higher education institutions are growing at a tremendous pace to foster knowledge creation, information processing and dissemination of information (Zakaria, Janjua & Fida, 2016). HEIs are recognised by governments and stakeholders as key agents for social and economic development. According to Kadir, Johari and Hussin (2018), countries whose higher education sector is weak and inactive in ICT will be incessantly marginalised in a world whose economy is knowledge driven. Hence, each country tries to improve the quality of higher education programmes through IT (Ratheeswari, 2018). Ghani, Zhai, Spector, Chen, Lin, Ding and Usman (2020) expatiate that many a time when the issue of quality in higher education is being discussed in Africa, the focus is always on the improvement of resources and facilities and quality of teaching and research (Ratheeswari, 2018). Meanwhile, information needs and information-seeking behaviour cannot be downplayed.

In a study carried out to review and assess the ICT in education initiatives in Ghana, twenty initiatives were selected (Adarkwah, 2021). Their impact was assessed to see what lessons could be learnt (Ministry of Education, 2008). According to the Ministry, initiatives contributed to a wider number of students and teachers acquiring ICT skills and developing strong interests in ICT and Science. Schools included in the initiatives were encouraged to expand the project and/or acquire more ICT equipment. Lessons learnt from the initiatives provided good examples for other schools to introduce their own ICT programmes. The projects themselves faced several encounters. At least half of the initiatives have been launched as pilots with none expanded into

national initiatives. Implementation challenges include a poor selection of schools without the involvement of Ghana Education Service (GES) / Ministry of Education (MOE). Even though this bold initiative did eventually add up to knowledge creation, Mubashir-Ahmed and Richard (2015) posited some challenges were faced, which include the following:

- A heavy reliance on external funding;
- Most initiatives stopped after exhaustion of initial funding;
- Dumping of outdated and unsuitable equipment as support for the initiatives;
- Low levels of ownership at school level to external incentives;
- Low understanding on the part of the recipients about the advantages of ICTs in education; and
- Lack of trained ICT personnel.

These challenges could be addressed properly with more research carried out on information needs and information-seeking behaviour of students.

Furthermore, there is an acknowledgement that, to ensure success and sustainability, ICT in education projects should be executed not with the mindset of increasing the number of computers but rather be based on supporting distinct educational purposes (Hasani, Xhomara & Kasumi, 2020). The lessons learned from the initiatives further emphasised the need for a synchronised, concentrated and appropriately managed method to the approval and utilisation of ICTs (Mubashir-Ahmed & Richard, 2015). Such an approach could further improve the accessibility and delivery of quality education and better maximise the impact of ICTs in education. The ICT in the education policy of the MOE in Ghana is based on the premise that there are several key elements that underpin the use of ICTs (Agrawal & Mittal, 2018). These include instruction and learning, organization and administration, communiqué and access to information. Moreover, it is admitted that these elements depend on policy reforms, both inside the education sector and within other unified sectors including, local government, rural development and communications among others (Savov, Terzieva, Todorova and Kademova-Katzarova, 2019). Furthermore, four crucial elements are recognised in the development of ICTs within the education sector. These important well-known elements are equity, norms, access to ICT infrastructure and capacity building (Smith et al., 2018). In other to be impartial and fair concerning the allocation of resources, the principle of equity ought to be followed so that it will adequately inform the chosen strategies and approaches for a successful planning. More so, for the end-users to benefit greatly in the ICT in

education initiative, the physical infrastructure like classrooms and electricity ought to be available. According to Abbas and Siddique (2020), envisioned users of ICT in education must be well equipped with the requisite skill, behaviour and knowledge for using technology for the intended task. Therefore, capacity building is very key in the planning process of the ICT in education initiatives (Hasani, Xhomara & Kasumi, 2020). The majority of LMS try-outs were cancelled due to inadequate Internet speed, server maintenance issues, and the lack of an official license (Muianga, Barbutiu, Hansson & Mutimucuo, 2019).

1.3 Rationale for the study

According to Tokareva, Smirnova and Orchakova (2019), the daily growth of information brings about problems about where to locate the information, acquisition, how information is organised and funds for infrastructure. Whenever users find themselves in a situation or location and discover useful information, they tend to gain a level of satisfaction; however, they become very frustrated when the information quality is below standard (Machdar, 2019). The problems escalate when students in tertiary institutions need information for their academic activities, which cannot be taken for granted (Yoon & Chung, 2017). For instance, students need to search for data mostly without assistance when they are given assignments and should do presentations. Furthermore, any library's ability to be an effective learning resource is hampered by the ever-increasing volume of information acquired and published, the expanded formats of data storage and retrieval, and the ever-changing education and research requirements of library users (Afolabi & Abidoye, 2011). For this reason, most modern libraries are now automated or computerised and, in most cases linked to the internet to help curb the problem pertaining information retrieval and utilisation (Kaur & Sharma, 2018).

Although institutions of higher learning in Africa are generally aware of the impact, if not indispensability of ICT on learning and research, ICT is still rarely and under-utilised to enrich these activities in many universities because of factors such as the absence of connectivity, among others in the institutions (Nwone & Mutula, 2018). This, notwithstanding, students usually face a great deal of trouble in their search of information in respect of proper ICT skills for information search and attitudes towards the usage of ICT (Hinostroza, 2018). A well-expressed and continual determination is essential to offer and make ICT facilities more accessible and usable to students in African universities, especially Ghana comma after Ghana where effort have been made to curtail the problems over the past few years. Secker (2018) emphasises that information is very

critical and is needed in people's lives daily. People are constantly challenged to take charge of the information that they need for daily endeavours. According to Zhong et al. (2018), information-seeking behaviour differs among user groups. This has necessitated the need for the management of ICT facilities and academic libraries to understand the information needs of users, in this case students, to address those needs. Toyo (2017) emphasises that these problems get worse when users, especially students, find it difficult to locate and use information they consider it useful. O'Brien, Dickinson and Askin (2017) notes that in the course of seeking information the individual may interact with manual information systems such as a journal or a library, or with computer-based systems such as the World Wide Web. However, Binu (2020) enumerate several advantages of e-resources over the print media. These include multi-access, speed, functionality, content, international reach, unlimited capabilities, reduced cost, convenience, searchability and linking (Gordon et al., 2020).

Clark (2017) studied the information-seeking behaviour of students in the college. She reported that most students visit the library daily as the most preferred source of searching the required information. Information search activities included indexing and abstracting periodicals and citations in articles. In addition, current journals were preferred to books. Ismaila (2019), citing Cothey (2002), studied the information-seeking behaviour of 206 college students during a 10-month period, who used the World Wide Web. The goal of the study was to get a sense of how the general public uses the internet. As a result of their increased use of the Internet, Web users have grown more passive and eclectic. Cothey also discovered that student use fewer querying techniques; however, their Web usage was more sporadic which might suggest greater selectivity. The rationalisations justify, to a large extent, variations in information-seeking behaviours explored in the study, such as students' information search activities and the frequency of visitation made to the library by same.

The information-seeking behaviour of scholars has been the focus of inquiry within the library and information science community for decades (Salem & Stephany, 2021). As such, this study attempts to provide useful information on students' information needs and behaviour for information managers, information scientists, students, researchers and lecturers to plan the right course of action for the effective use of ICT in furthering and supporting students' education. The results of the study established the existing gaps in the adoption of ICT in the information management operations of universities in complementing the academic library services. The study also provides a basis for comprehensive information on the ICT application in the university. This

study has the potential to lead to the design of appropriate information systems and formulation and implementation services that can aid in making the search for information less stressful. Hence, the results of this study can serve as useful information for librarians and information managers in the UCC to improve their information systems to promote effective studies.

1.4 Problem statement

Survival for mankind in this era of information age regardless of how well or efficient individuals are in a particular field or profession is very critical (Berget, 2020; Abdullahi, Igbinoia & Solanke, 2015). The fast proliferation of information in the current time has substantial effect on educational systems and library usage by students in the university (Kadir, Johari & Hussin, 2018). University students from different backgrounds have diverse information needs and approaches of information-seeking for print and electronic sources. According to Kalantari (2017), worldwide university students trying to search for information are susceptible to challenges such as existing information gaps in their quest of their scholarly works. These challenges can be linked to the information need and information-seeking behaviour of the university.

In this current technological age, the quick spread of information has had significant implications for the education and library usage of students in general (Tariq, Rehman, Mahmood & Mustafa, 2018). Surely, it is valuable and prereduced in every environment and as such, its acquisition and usage are very crucial and significant. With the intervention of ICT, most libraries now use various types of technologies to aid services that they render. The ICT and library resources of universities are useful to students' learning and research activities (John & Balasubramanian, 2019). John and Balasubramanian (2019) posit that the establishment of the ICT laboratory has contributed much to the research needs of the students by way of complementing the services provided by the library. However, as asserted by Stellefson et al. (2018), due to different information needs and information-seeking behaviours among user groups, it has become necessary to understand the information needs of users, in this case students, to address those needs.

Inevitably for tertiary students, in the contemporary era which is characterised by dependence on ICT, information-seeking has become part and parcel of the learning process with its possible associated problems such as the difficulty in locating and using information considered useful (Mussa & Antonio, 2020). Ismagilova, Hughes, Dwivedi, and Raman (2019), asserts that in as much as there exist different dimensions of knowledge, one critical concept that plays a vital role

in these aspects or dimensions is information. With this, for individuals to easily recognise answers to critical questions related to this phenomenon will depend on the availability of enough research (Aliannejadi, Zamani, Crestani & Croft, 2019; Makinde et al., 2021). Makinde et al. (2021) assert that, there has been increased agitation for empirical research into the information needs and the related information-seeking behaviour of the public, students in the case of this study to be specific. More so, Mwinyimbegu (2019) emphasises that facilities, together with materials needed for a well-informed research are difficult to obtain in libraries. These statements, thus, indicate that the students need to be informed about how their information needs and information-seeking behaviour can be adequately addressed for them to be qualitatively attended to during their research. According to Thindwa, Chawinga and Dube (2019), most students are confused whenever they are given a task to do. Thus, regardless of the provision of information sources, students still worry their lecturers for further clarification and advice on the way to tackle the assigned task. In addition, these authors assert that students seem to be more confused whenever they visit the library to use information sources such as the internet and crowd the office of the librarian seeking support on issues that have to do with information-seeking. Consequently, the situation is not different for students at UCC.

The researcher, in his capacity as a staff member at UCC, has observed that most students appear to suffer from failure to utilise the basic retrieval tools used to gain information. They lack suitable preparation on IT user skills such as the use of Web-based resources obtainable at UCC library and space particularly with the increasing number of students on campus similar to what has been experienced (Bonsu, Bervell, Kpodo, Arkorful & Edumadze, 2020). Toyo (2017) states that, in Nigeria, students from Delta State University have adequate information regarding library resources, specifically electronic resources, however, students lack the technical skills. These authors also state that there are limited library facilities, low internet connectivity on the university campus and unpredictable power supply at the time of accessing these information resources. Furthermore, Wasike (in Mussa & Antonio, 2020) posit that students' information needs and information-seeking behaviour difficulties, which they experience, may be linked to some challenges, which students have in optimally applying academic library resources in general. However, understanding the information needs with respect to the ICT and library resources of university students has been under-researched and an inquiry into it can be of great significance to information managers in public institutions who invest in literature materials and search tools to enhance students' learning and research. Therefore, the knowledge of information-seeking needs and behaviour of students is paramount to these managers as this will enable them to implement

sound information management practices which address students' information needs well (Thindwa, Chawinga & Dube, 2019). However, lacking in this effort is provision of adequate research in information needs and behaviour of students, a sure drive for this study.

Delaney and Bates (2018) add that a library is one of the key support systems for information, thus, the duty of librarians in providing the needs of students ought to be properly examined. Currently, limited studies have been done on information needs and information-seeking behaviour of undergraduate students, particularly in Ghana. Despite previously conducted research literature this study differs from them in that a segment of UCC students, specifically the Education Faculty students, are being investigated since they sometimes move out of campus to do external activities like teaching practice (Kwatubana & Bosch, 2019). The problem statement leads to the following main research question from which the specific questions are derived:

1.5 General question

The following research question was generated to help achieve these goals: *What are the information needs and information-seeking behaviour of the Faculty of Education students at the University of Cape Coast?*

The following sub-questions were developed from the problem statement subsequently:

- What kind of information is needed by the undergraduate students at the University of Cape Coast?
- What are the types of information resources that are utilised by the undergraduate students of the institution under study?
- What strategies do the undergraduate education students employ in seeking information resources in the university?
- How efficient is the University of Cape Coast ICT resources, including the library, to students with respect to promoting sound learning and research work?
- Do statistically significant differences exist between groups of undergraduate UCC education students in reference to their background information (gender, age, and academic level) to constructs of the usage of ICT resources, computer skills of students, ICT software, information-seeking behaviour, ICT support services, usage of library resources, problems in the usage of ICT resources, problems in the usage of library resources, possible solution in the usage of library and ICT resources?

- In what ways can the strategies for satisfying information needs and seeking behaviour of the undergraduate students at University of Cape Coast be improved to promote sound learning and research work?

1.6 Objectives of the study

The aim of this study is to explore the information needs and information-seeking behaviour of Faculty of Education students at the University of Cape Coast. To achieve this aim, the study specifically seeks to:

- explore the kind of information that are needed by the undergraduate students at the University of Cape Coast;
- examine the types of information resources that are utilised by the undergraduate students of the institution under study;
- investigate the various strategies do that undergraduate education students employ in seeking information resources in the university;
- ascertain the efficiency of the University of Cape Coast ICT resources, including the library, to students with respect to promoting sound learning and research work;
- examine whether statistically significant differences exist between groups of undergraduate UCC education students in reference to their background information (gender, age, and academic level) to constructs of usage of ICT resources, computer skills of students, ICT software, information-seeking behaviour, ICT support services, usage of library resources, problems in the usage of ICT resources, problems in the usage of library resources, possible solution in the usage of library and ICT resources;
- identify the determinants that govern the computer skills of students and their information-seeking behaviour; and
- establish ways of improving for satisfying information needs and seeking behaviour of the undergraduate students at the University of Cape Coast be improved to promote sound learning and research work.

1.7 Hypotheses

Linked to the sixth objective which is to identify the determinants governing computer skills of students and their information-seeking behaviour, the researcher formulated nine hypotheses. The hypotheses are:

H₁: Usage of ICT resources has an influence on computer skills of students.

H₂: Usage of library resources has an influence on computer skills of students.

H₃: ICT software has an influence on computer skills of students.

H₄: ICT support services has an influence on the computer skills of students.

H₅: There is a relationship between usage of ICT resources and information-seeking behaviour.

H₆: There is a relationship between usage of library resources and information-seeking behaviour.

H₇: There is a relationship between computer skills of students and information-seeking behaviour.

H₈: There is a relationship between ICT software and information-seeking behaviour.

H₉: There is a relationship between ICT support services and information-seeking behaviour.

1.8 Significance of the study

The knowledge obtained in this study would provide an understanding to the educationists and policy makers of the issues students encounter in relation to their information needs as well as information-seeking behaviour. It would also help authorities to make policies that would help students gain easy access to educationally relevant information. The results of the study would serve as a guide to students on how to fulfil their information needs. Knowledge obtained from this study can give direction to the professionals in the field of education on the need to pay attention to the information needs of not only tertiary education students but also those in other specialisations as well. The study would also contribute to research in information needs and information-seeking behaviour of students adding to existing literature.

The study provides useful information that can serve as a basis for comprehensive information on ICT application at UCC. In addition, the results of the study would establish the existing gaps in the adoption of ICT in the information management operations of universities in complementing the academic library services. This has the potential to lead to the design of appropriate information systems and formulation and implementation services that can aid in making students search for information in a less stressful manner. Therefore, the results of this study can serve as a blueprint for librarians and information managers at UCC to plan the right course of action for the effective use of ICT in furthering education through policy.

1.9 Brief overview of research methodology

One fundamental framework underpinning the execution of any research is the methodology (Creswell & Creswell, 2017). It comprises complete designs and frameworks utilised for particular research (Elsbach & Stigliani, 2018). For this study, both quantitative and qualitative approaches

were adopted because of their ability to give an in-depth understanding of the phenomena of information needs and information-seeking behaviour of students at UCC. Data were obtained through mixed methods. The data were obtained using a structured questionnaire, open-ended semi-interview, observation and content analysis. Quantitative data were analysed using the Statistical Package for the Social Sciences (SPSS). Qualitative research, according to Rudolph, Leedy and Ormrod (2015), is a more unique and flexible method than quantitative research. Furthermore, Rudolph, Leedy and Ormrod are confident that qualitative research allows researchers to understand and evaluate people's actions and experiences while conducting data collection interviews. Therefore, the qualitative data in this study supports the researcher to comprehend the phenomenon better (Lester, Cho & Lochmiller, 2020). The complete research methodology is discussed under the research methodology chapter.

1.10 Delimitation of the study

The study is delimited to the information needs and information-seeking behaviours of the university students. This study is further delimited to education students at UCC. Thus, students of other faculties are not included in this study.

1.11 Definition of key conceptual terms

The following key concepts are defined to create their understanding as applied in this study.

1.11.1 Information

To argue about or learn a concept, one must define it first (van Mil & Henman, 2016). Defining information is very relevant since the other concepts that are used in this study are built on information. Many scholars have defined information differently in terms of their understanding and interpretation across different disciplines (Humphrey & Ray-Ogbonna, 2021). Meijer (2013) define information as anything that an agent can sense, detect, observe, perceive, infer or anticipate is considered information. This author further clarifies that it is information that have been exposed to some manipulative roles proficient of responding the user's query, be it recorded, summarised or merely obtained that would aid in decision making. This is well typified by journals, magazines, books and a variety of public and private segment documents. Yevtushenko and Siryk (2020) establish that information is essential in man's diurnal activities, whether in school, play or work situation. Furthermore, Tetteh (2020) cites Kaniki (2001), who defines information as ideas, facts, and imagination and data of value, which are potentially useful in decision making, provision of

answers and solution of problems. It is apparent, from the explanation that information is vital to man's existence. Hence, information will usually be considered as important knowledge, produced as the yield of processing operations, and acquired to deliver understanding in order to attain specific purposes or enhance understanding.

Furthermore, Samimi (2020) postulates that information is linked to some concepts such as knowledge, news, facts and instructions. According to Abdulhakovna and Gulomovna (2020), information is the acquisition of data by human beings through the known conventions that are used in their representation in that the meaning is affected by the discipline with which they are connected to. As a result, information will typically be regarded as valuable knowledge obtained as a result of processing activities and used to achieve certain goals or improve understanding.

With consideration to the context of this study, information is comprehended based on the delineation of Eskola (1998), as a range of facts which students need during their studies when they make meaning about the subjects in the process of learning. The aforementioned researchers' hypotheses concur that the farther up the academic ladder students travel, the more academic material they require to challenge various information-seeking encounters (O'Donoghue, 2006; Tella, BodeObanla & Sulyman, 2020), typically in research tasks assigned to them. At a higher level, students tend to be given chances to organise their own learning. More assignments and projects are given that will oblige them to search for information. With the new era of technological advancement, these students inevitably find themselves most often accessing electronic devices for information such as surfing the internet by means of computers, smart phones and so on (Kwafoa, Barfi & Agyapong, 2019). Considering the number of years, the education students take to complete their programme, it could be assumed that there exist differences and similarities in information-seeking behaviours of the students in the same and different year levels. This could result from the nature of courses undertaken by the students in a particular level of study and/or their levels of experiences or knowledge in the use of information technology resources among others (Agyemang, Ngulube & Dube, 2018).

1.11.2 Information needs

An information need arises from a sense of something lacking, necessitating the search for information that can help with comprehension and meaning. "An information need is a requirement that drives people into information-seeking" (Ikoja-Odongo & Mostert, 2006:147). Information needs is a common term in information science, but it is rarely mentioned in general

literature as explained by Zhao and Zhang (2017). Manjunath and Babu (2018) contend that information need is closely connected to the notion of relevance, thus if something is relevant for an individual in relation to a specific task, one might say that the information is needed for that task. According to Cook (2017), information needs as a concept has been challenging to define because a need is a personal experience that happens in the minds of people and therefore only the individuals experiencing that need can express it. Furthermore, Daei, Soleymani, Ashrafi-Rizi, Zargham-Boroujeni and Kelishadi (2020), argues that an information need comes about when a person senses a challenging situation or a gap in information, in which the person's internal knowledge, norms and beliefs and the atmosphere fail to give a direction in satisfying his or her goal. Such a recognized need may subsequently result in information-seeking and the quest for information (Androutsopoulou, et al., 2019). Abukari and Menka (2020) also argue that information needs are not fixed but change with time and differ from individual to individual, task to task, issue to issue and organisation to organisation. This then implies that the particular context in which a person finds himself or herself, i.e., the need(s) which that contextual space from the person demands, would play a vital role regarding which information and which related sources are valued and pursued.

Despite the difficulty of explaining the notion of information need, some authors have come up with several definitions. Kembro, Näslund and Olhager (2017) explained that information need is, one making sense out of a challenging or difficult situation. In such instances, answers ought to be provided for the questions in the minds of the individual (Sivasanthiran & Samaradiwakara, 2020). Dervin (2005) describes those questions as information needs. Furthermore, an information need can be characterised as a true but unspoken demand for knowledge, or an ill-defined topic of debate that can be communicated in a rambling, confusing remark (Rather & Ganaie, 2019). Nonetheless, Rather and Ganaie (2019) believe that an information need may start as a vague sort of dissatisfaction, which is characterized by confusion and perplexing reaction to a vague new idea. This confusion increases and mounts until the person may be threatened by his / her lack of understanding. Ingwersen and Jarvelin (2005:36) argue that information need is “a consciously identified gap in the knowledge available to an actor”. In addition, Wilson (1999) noted that an information need arises from secondary or basic needs that are characterized by affective and physiological needs which ought to be satisfied by searching for information.

The above-mentioned definitions largely depict that information needs are occurrences or gaps in the lives of people which call for a deliberate search for information to normalcy.

1.11.3 Information-seeking

According to Ori and Berry (2020), information-seeking is undertaken to identify a message that satisfies a perceived need. This activity, as understood by Kakhki, Harati and Doreh (2019), may be enthusiastically or reservedly done when taking steps to gratify a felt need. Information-seeking behaviour includes the activities that a person might engage in when defining their own information needs, searching for it in any means, and using or transmitting it (Lamont & Weaver, 2020). Jabeen, Jeelani and Ganaie (2020) simply note that research on information-seeking has looked at how individuals go about finding the materials that they need to satisfy information needs. According to Rafiq, Iqbal, Rehman, Waqas, Naveed and Khan (2021), information-seeking is undertaken to identify a message that satisfies a perceived need. This activity, as perceived by Van Lieshout, De Lange and Cools (2020), may be actively or passively done when taking steps to satisfy a felt need. According to Agyemang, Ngulube and Dube (2018) information-seeking behaviour includes those acts that a person may engage in when defining their own information needs, searching for it in any means, and using or sharing it.

Mayweg-Paus, Zimmermann and Pinkwart (2020) explained information-seeking behaviour as an individual's way and manner of gathering and sourcing information for personal use, knowledge updating and development. Again, the researchers note that the information-seeking behaviour of students, researchers and professors has been the focus of enquiry for decades. Zhao and Zhang (2017) also note that research on information-seeking has looked at how individuals go about finding the materials that they need to satisfy information needs.

The topic of finding information to meet one's requirements spans across the definitions and explanations listed above. Similarly, the current study sought to determine students' satisfaction with information availability and information-seeking tactics. The act of deliberately seeking information in order to answer a specific enquiry is known as information-seeking behaviour (Gowreesunkar & Dixit, 2017). People's search for information and use of that information to perform their assigned task is known as information-seeking behaviour. People in all lifestyles require information. According to Ayesha Sultana (2016), information-seeking behaviour refers to a series of acts that include identifying information needs, seeking information, evaluating and selecting information, and finally putting that information to use.

1.11.4 Information-seeking behaviour

Zimmerman and Shaw (2020), defined information-seeking behaviour as an individual's way and manner of gathering and sourcing for information for personal use, knowledge updating and development. Again, Jalali, Keshvari and Soleymani (2020) noted that information-seeking behaviour of students, researchers and professors has been the focus of enquiry for decades. One vital component that students in most learning institutions embark on is the way they seek knowledge and ideas in their process of learning (Wilson, Tucker, Hannibal & Qu, 2021). Furthermore, educational institutions' ambition is to increase the student's satisfaction regarding the timely provision of adequate and relevant information which are easily accessible in the right format (Donald, 2012). On the other hand, some students may find it difficult in searching for information thereby, facing some challenges while looking for academic resources (Koesten, Kacprzak, Tennison & Simperl, 2017). According to Nwagwu and Ajibade (2020) information-seeking behaviours are the various actions people may exhibit when detecting their specific needs for information, seeking for that information and utilising that information (Wilson 1999:249). In other words, the effort one put to satisfy the identified need would lead to the information-seeking behaviour. According to Aldousari and Almuomen (2020), information-seeking behaviour is a behaviour of humans in search for information in a purposeful manner to fill a gap. These authors add that this behaviour is sometimes indescribable. Furthermore, according to Sahu and Singh (2013), information-seeking behaviour manifests itself in a variety of ways, including reading published resources in order to study and explore.

There are many and varied assessments of the literature on information-seeking behavior. Weber, Becker and Hillmert (2019) point out that undergraduate students halt searching for information when they come to conclusion that they have enough information for any task assigned to them. Quadri and Oluwasina (2017) state that most students search for adequate information to satisfy their course needs.

1.12 Chapter divisions

Chapter One presents the introduction and background to the study. This chapter provides the rationale for the study, an overview of scholarly literature review on the problem and statement of the problem. In addition, it introduces the aim and objectives of the study, followed by the significance of the study and a brief overview of the research methodology.

Chapter Two discusses literature reviews on the concept of information, information-seeking and information-seeking-behaviour. It discusses the role of the ICT in information dissemination and ways of improving information-seeking strategies. A brief background on ICTs in education in Ghana is also provided. Previous studies on the information-seeking and needs of students and similar concepts are also discussed.

Chapter Three discusses the theoretical framework which served as a lens for the study. Both the weaknesses and strengths of the theoretical framework are acknowledged, and a stance taken about its choice as well as an illustration given as to how it applied in this study.

Chapter Four provides an in-depth discussion on the research methodology. The philosophical perspective(s) in which the study is situated are discussed at length. The chapter also provides justification for the methods of data collection employed for each research area.

Chapter Five presents the quantitative and qualitative results of the study.

Chapter Six triangulates the findings.

Chapter Seven concludes the study and provides the reflections which bring the results of all analyses performed into perspective. Limitations and directions for future research are also presented in this chapter.

1.13 Conclusion

This chapter covers the background, rationale, statement of the problem, research objectives and questions, aims, significance, overview of methodology, conceptual descriptions and chapter divisions for this study. The majority of the literature that was found and examined was focused on industrialised countries. The small amount of literature discovered in the setting of underdeveloped countries does not address the concerns surrounding the information needs and information-seeking behaviour of Ghanaian students.

To add, the reviewed literature shows that existing works have largely focused on the use of either the qualitative or quantitative method singly rather than adopting the mixed method that is also suited for investigating information behaviour related problems. This study, therefore, adopts the

mixed method approach to provide a deeper understanding of the problem. The next chapter provides the literature review for the study.

Chapter Two

Student information needs and seeking behaviour: A literature review

2.1 Introduction

Chapter 1 has introduced the study and highlighted information needs and seeking behaviour as the main constructs in the study. These constructs caused the researcher to conduct extensive literature search on the problem identified around these constructs as reported in Chapter 1 Section 1.5. Subsequently, Chapter 2 reports the surveyed literature. The concept of information is reviewed in this chapter in the context of the ICT environment. The role of the ICT and library in information dissemination and the strategic process of information-seeking are discussed. Relevant literature on information needs and seeking is also discussed. Finally, the section presents the means of improving information-seeking strategies for more successful information-seeking behaviour.

2.2 Information in the context of the ICT environment

Human being used to live in an environment where the existence of information was not enough (Mingers & Standing, 2018). However, now there is more than enough information for human consumption due to today's digital world (Zsarnoczky, 2018). The current environment and ICT have a complicated relationship since, on the one hand, ICT expansion is considered to deteriorate the environment by employing ICT products, but on the other hand, ICT can strengthen environmental protection (Toader, Firtescu, Roman & Anton, 2018). According to Wang, Liu and Parker (2020) ICT increases and improves the sharing of knowledge and access to information. This concurs with the notion of Hatlevik, Throndsen, Loi and Gudmundsdottir (2018) that ICT in our environment today has drastically changed how individuals retrieve, gather, examine, convey and simulate information. The quest for knowledge or information today is due to human beings' need to describe and comprehend his or her world (Hernandez, 2017). Currently, available information can be recorded and accessed on an unconstrained and instant basis, and the spread of information thereof happens across all spheres of an individual's life, including education, politics and many other different spaces (Xue, Wei, Bruschi & Chih-Lin, 2019).

In addition, the substantial amount of information produced now in our society has impelled its description as the knowledge-based society. Hence, technology plays a major role in the relationship that exists between information and the world today (Aceto, Persico & Pescapé, 2018). In this sense, the development and transformation of our world today, especially the education area, has seen a connection between technology and information, which plays a crucial role and changed the manner of interacting, studying, communicating and researching (Ratheeswari, 2018). The rapid growth of information technology has also enabled organizations to transact businesses in a faster way which in the long run has efficiently maximized productivity. This has been made possible because there has been a faster way of communicating and transmitting information via various means (Liu & Niederdeppe, 2017).

The term information, according to Ruthven (2019), is the precise instances of actuality as experience comprehended by a person in a particular setting. Accordingly, Middleton et al. (2019) view information as something which students need during their studies while they construct meaning about the subjects in the process of their learning. Comparing favourably with this assertion, Kaniki (1992:19) defines information as “ideas, facts, imaginative works of the mind and data of value, potentially useful in decision making, question answering and problem solving. It leads to a state of knowing”. Kaniki’s (1992) definition draws attention to the fact that there exist two states of information namely intrinsic and extrinsic. Borrego, Ardanuy and Urbano (2018), however, argues that information is obtained when some human mental activity (observation, analysis) is successfully applied to the data to reveal its meaning or significance. Accordingly, Lewandowsky (2020) subsequently defines information as any difference one perceives in one’s environment or within oneself.

Worldwide, most tertiary institutions provide suitable and reliable academic education comprising of research, teaching and service (Panday & Purba, 2015). Panday and Purba (2015), further explain that through the provision of ICT in our environment now, one can access information anytime and anywhere including prospects for networking and communication for information sharing, participation and all-time education. With the new era of technological advancement, students inevitably find themselves most often accessing electronic devices for information such as navigating through the World Wide Web or Internet utilising laptops (netbooks) and smart phones etc (Abdekhoda, Gholami & Zarea, 2018; Chang & Gomes, 2017). On the level of accessibility of information, results obtained by Ashiq, Rehman and Mujtaba (2021), indicated that academic information is accessible and that University of Botswana students are pleased with

the information facilities delivered by the university. This, the authors attributed to ample investment being made into information technology for teaching and learning in the institution, unlike most comparable institutions in Africa. Ajiboye and Tella (2007:41), on the other hand, report that most of the universities in Nigeria, for example, lacked internet connectivity. Also, results obtained by Ajiboye and Tella (2007) showed that more than 25% of the students were not satisfied by the level of information they are getting from the Internet services. Contextually, due to the latter, an inquiry into the accessibility of ICT laboratory and library to the education students in University of Muzutta (UM) has been recommended.

According to Zsarnoczky (2018), the relationship between information and the ICT environment is complicated, as the ICT environment can have both positive and negative effects. In an ICT setting, students may have the opportunity to study problems, explore ideas, and create concepts. Students not only acquire knowledge together, but they also share a variety of learning experiences in order to express themselves and reflect on what they have learned (Tofi, 2019). ICT introduces students to a completely new learning environment, necessitating the development of new skills. As students face increasing volumes of information from a variety of sources, critical thinking, research, and assessment abilities are equally becoming increasingly important (New Media Consortium, 2007). ICT is transforming teaching and learning processes by infusing vitality into learning environments, including virtual environments (Ajah and Chigozie-Okwum (2019).

2.3 The role of ICT in information dissemination

ICT plays a crucial role in circulating information all over the world and it enables users enough information from different parts of the world and assist in quick communication between them. ICT facilitates the diffusion of information and knowledge by isolating material from its geographical location (Ajah & Chigozie-Okwum, 2019). The implication is thus that this flow of information is largely impervious to geographic boundaries allowing remote communities to become integrated into global networks and making information, knowledge and culture accessible in theory to anyone (Poekar, 2018). According to Ajah and Chigozie-Okwum (2019), information and communication technology (ICT) aids in the processing of large amounts of data in a timely, precise, and error-free manner, making data retrieval easier. According to Krishnaveni and Meenakumari (2010), information and communication technology (ICT) aids in creating a good communication system in higher education, as well as giving timely information to all the parties involved. Communication could be used to gather and disseminate information both

internally and externally. The goal is to communicate with the system's key stakeholders such as distributing e-circulars to learners, instructors and staff.

Coccia (2019) explained technology as the adaptation of knowledge to the practical goals of human life, or, as it is sometimes called, the transformation and manipulation of the human environment. The explanation of technology from Coccia (2019) is ubiquitous in most societal contexts within the United States and most other industrialised countries. According to Bilson and Markwei (2019), ICT has enabled academic libraries to share cataloguing information which results in saving time, minimizing cost and preventing duplication in categorizing information resources in academic libraries. Apparently, it is not only the internet which is gaining popularity in education worldwide but also all sorts of ICTs such as mobile technologies are also putting up robust momentum in the same field (Stanojevic & Rakic, 2018).

Technology has made most society increasingly interconnected, which most people have termed as the “Connected Age”. A decade ago, access to technology was limited, as such wiring schools was one of the country’s highest education priorities. However, due to the expanded access to technology, there is a growing prevalence of technology in society (Davies & West, 2014). Sreeram and Gupta (2017) are of the view that the current generation of young people focuses on technology, particularly the internet, and this has taken a substantial stake in their social and educational lives. The ICT literacy reflects the need for the students to develop learning skills and enable them to think critically, analyse information, communicate, collaborate, solve problems. This has become an essential role that technology plays in realising these learning skills in today’s knowledge-based society (Thomas, Prajapati & Kaur, 2022). Students can learn with computers as now tutors mostly use technology to engage with their students and this serves to increase students’ basic skills and knowledge (Sreeram & Gupta, 2017). ICT goes a long way to serve as a resource that helps develop advanced order thinking, creativity and research skills (Vargo, Zhu, Benwell & Yan, 2021; Madu & Azubogu, 2017).

New advances in the Web, according to Raja and Nagasubramani (2018), present users with many options to personalise tools and services and engage in self-directed learning in an open and social setting with their unique learning environments. Students can create their own personal learning environments by combining various tools, materials and human resources, and then participate in various learning activities and courses with their personal learning environments (Lin & Chen, 2017). Technology has made the world a global community where students are being prepared for

this global community and technology (Davies & West, 2014). Universities have adopted technology in their learning environment through which a range of pedagogical and administrative tools is offered for teaching and learning (Rhode, Richter, Gowen, Miller & Wills, 2017; Naim & Alahmari, 2020).

Technology in education has influenced different facets of educational life, thus it has had a significant positive effect on students' achievement in the educational sectors. During standardised assessments for basic skills development, most students who work with a technology instructor outperform their peers (Bond, Zawacki-Richter & Nichols, 2019). Studies indicate that students with extensive access to technology learn how to organise complex information, recognise patterns, draw inferences and communicate findings (Lu & Sun, 2020). Moreover, this is in line with the study conducted by Ashour (2020), who illustrated that technology could increase students' utilisation of educational resources and improve their aptitude to process and recall information. A study by McKnight et al, (2020) has also shown that the use of technology in the classroom improves students' motivation and attitudes about themselves and about learning. Moreover, students who regularly use technology take more pride in their work, derive greater confidence in their abilities and develop higher levels of self-esteem (US Department of Education, 1995). Technology use has a tendency of promoting partnership among students (Istance & Kools, 2013) and aid in the enhancement of activities in the learning environment (U.S. Congress Office of Technology Assessment, 1995).

A study by Guijas, Montenegro-Burke, Domingo-Almenara, Palermo, Warth, Hermann and Siuzdak (2018), shows that information access has been made possible by technology. In other words, technology has enabled instructors and students to gain opportunities to work with an extraordinary array of authentic materials and up-to-date information that would not have been possible without ICT. Educationalists can personalise lessons via incorporating technology into their curriculum and tailor it to the academic needs of students (El Miedany, 2019; Bartolomé, et al., 2018). Due to the obvious explosion of information, it is dispersed in many locations, and many libraries have begun to embrace contemporary developments in information technology in order to provide appropriate library services. (Mahanta, 2020). As a result, the function of library services emerged as a distinct field of this research, with the goal of providing insights that would help maximise the use of information technology in library operations for effective library service.

2.4 The role of the library in information dissemination

Libraries have always been repositories of learning resources. According to Chau and Hu (2001), and Alzahrani et al., (2019), the library system serves as a place where computers can be effectively used for educational management. Rahimi, Feizi and Hoseini (2018) define academic libraries as those libraries that are mainly found in tertiary institutions and are established to support learning, teaching and research processes. They have provided scholars and researchers with access to knowledge since the beginning. The fundamental function of a library is to provide information services to residents of their communities in order to assist their educational, recreational, cultural, economic, and technological endeavours (Chau & Hu, 2001). The library is one of the most significant parts of educational support services (Ghana National Policy on Education, 2004). It is utilised as a tool for the development of intellectual talents and the promotion of cultural and social integration, as well as a medium for sharing information and increasing literary searches.

Tofi (2020) stresses that the library is indispensable to the success of any functional education as a store of knowledge. This author further states that education without the services of the library is half-baked education that can only produce narrow-minded individuals, which will not be productive in their community. Every day, new technology advancements have an impact on how libraries and information centres handle information. As a result, efforts are undertaken to acquire, process, maintain and make available the resources to users (Onuoha & Obialor, 2015). The ultimate goal of all efforts towards the effective and efficient services is to provide services that are most valuable to the library's patrons. Computing, networking and mass storage technologies are just a few of the areas in which libraries are reshaping how they access, retrieve, store, manipulate, and disseminate information to users. Rather than being an add-on or an afterthought, the academic library has been an intrinsic part of higher education institutions since its establishment (Onuoha & Obialor, 2015).

ICT has touched every field of academic library activity, particularly in the form of library collection growth methods, library building, and consortia, in addition to their establishments (Adindu, 2020). Manco-Chavez et al. (2020) assert that ICT presents an opportunity to provide value-added information services and access to a wide variety of digital based information resources to their clients. Furthermore, academic libraries also use the modern ICTs to automate their core functions. These include implementing efficient and effective library cooperation and

resource sharing networks, implementing management information systems, developing institutional repositories of digital local contents and digital libraries and initiate the ICT-based capacity building programmes for the library users (Adindu, 2020). There is no doubt that ICT has brought unprecedented changes and transformations to the academic library and information services (conventional Library and Information Science-LIS such as online public access catalog-OPAC, users services, reference services, bibliographical services, current awareness services, document delivery, interlibrary loan, Audio visual services). As a result of the internet's emergence as the world's biggest reservoir of information and knowledge, the role of library information services has evolved, with the extinction of certain traditional information services and the creation of new and innovative Web-based information services (Khan, 2016).

2.5 Empirical studies on students' information needs and information-seeking

As mentioned earlier, Mansourian's (2020) assertion on the importance of information in the daily life of individuals cannot be overlooked or disregarded. An implication is that this regularly challenges taking control of the data needed for daily endeavours. Information-seeking behaviour is the purposive seeking for information by individuals because of a need to satisfy goals (Yoon & Chung, 2017) in that it deals with behaviour and actions exhibited by human beings in their search for information to satisfy diverse information needs (Poitras, Mayne, Huang, Udy and Lajoie (2019). Savolainen (2016) notes that while seeking information, the individual may interact with manual information systems such as a journal or a library, or with computer-based systems such as the World Wide Web.

E-resources provide significant advantages over print media (Aforo & Lamptey, 2012). Multi-access, speed, functionality, content, international reach, limitless capabilities, decreased cost, simplicity, searchability and connecting are just a few of them. Observation by Dayakar (2018) revealed that the prevailing crucial issue of information needs and seeking behaviour proposes different research models by some authors for identifying steps involved in this process, e.g., exploration as a system of stages and search as a tactical procedure and sense making.

2.5.1 The impediment to meeting information need

There are numerous hindrances of information usage. According to Chisango and Lesame (2019), an individual experiencing insecurity cannot identify his or her actual need because it is intangible,

and this leads to dissatisfaction of that need. Therefore, information needs are influenced by the following issues (Gürkut & Nat, 2017):

- varieties of information services accessible;
- results of information used;
- cultural, social, economic and political systems that surround the user;
- make-up, experience and skills possessed by the user; and
- how information will be used.

2.5.2 Various sources of information used by students

Information search entails the systematic way students or users embark on to get information and identify probable answers to their problems (Rangaswamy, Manjunatha & Kumar, 2017). Furthermore, individuals can search for the right information when they know the various sources of information available at their disposal. According to Gibson and Kaplan (2017), an information source is a carrier of information or something that a user identifies capable and proficient of informing or the avenues of getting information. As information has been explained as any processed fact or knowledge, it enhances decision making and provides power. Towards getting effective, right amount and well-timed information for academic purposes, one needs to know the kinds of available sources of information to utilise them in the right manner. Novak and Day (2015) posit that as most libraries bring together their collection for users to effectively use their materials, likewise, sources of information are also well arranged according to their type, contents or form to cater for the various needs of the customers or users. Information sources can be grouped under two comprehensive groups, which is documentary and non-documentary sources (Ubwa, Gbuushi, Ianna & Iornum, 2021). Ubwa, Gbuushi, Ianna and Iornum (2021), explain that documentary sources comprise primary, secondary and tertiary sources of information. The primary sources are research reports, dissertations, journal articles which are first-hand and original information source. In addition, secondary sources are sources of information which are dependent on the primary sources so that it will be useful, known and easily accessible for users, for example abstract type, technical translations, reference books, textbooks and reviews (Tetteh & NyantakyiBaah, 2019).

Furthermore, the tertiary sources of information are based on a collection of primary and secondary sources of information, thus it synthesizes or combines the research in secondary sources, for example, dictionaries, indexes, bibliographies and directories. Nevertheless, the non-documentary

sources of information are sources which are not recorded or noted down in any form. Under the non-documentary category are organisations, human conversations such as friends, colleagues and visitors, cyber media etc., (Morais, Moreira & Paiva, 2014). Getting relevant and timely information about a good is very crucial as different sources of information as part and parcel of every decision-making process an individual makes when analysing (Meštrović, Bagarić & Marot, 2019). Therefore, in this case most students use print materials, non-print materials, published and unpublished materials and library information to seek for vital information (Estacio, Whittle & Protheroe, 2019). The findings of a study examining the internet as a source of information conducted by Rangaswamy, Kumar, Manjunath (2017), points out that, the internet is one of the major research tools that support students in their daily academic encounters.

2.5.3 Information-seeking in stages

Some researchers have examined how the information-seeking process develops over extended periods of time. Kuhlthau (1991) conducted studies that showed that for complex information-seeking tasks, searchers go through different stages, both in terms of their knowledge of and their attitude towards the task. Prior to the development of the aforementioned model, Kuhlthau conducted many field studies ending with a concluding study of very large numbers of participants relative to similar studies. The author involved 385 academics, public and school library users at 21 sites. Most of the participants were high school students whose task was to write a research or term paper. The task took place over a very long period during which most of the students were given the topic rather than chose it themselves. The method by Kuhlthau (1991) was also rare since she did not only solicit the participants' views about their search process but also about their emotional state.

Kuhlthau's (1991) findings revealed both a common information access process and emotional patterns. She divided the process of information-seeking into six stages:

- **Initiation:** The task is to recognise a need for information. Searches relate to general background knowledge. As the participants become aware of their lack of understanding, feelings of uncertainty and apprehension are common. Thoughts centre on comprehending the task and relating the problem to prior experience.
- **Selection:** The task is to select the general topic or the approach to pursue. Thoughts are general and undifferentiated, and centre on requirements, time constraints, and which topic

or approach will yield the best outcome. Feelings of uncertainty often give way to optimism after the selection is made.

- Exploration: The task is to investigate information on the general topic to extend understanding. At this stage, an inability to express what information is needed degrades the participant's ability to formulate queries and judge relevance of retrieval results. Information encountered at this stage often conflicts with pre-existing knowledge and information from different sources can seem contradictory and incompatible. This phase is characterised by feelings of confusion, uncertainty and doubt, and participants may feel discouraged or inadequate, or may feel frustrated with the information access system itself.
- Formulation: This phase marks the turning point in the process, in which a focused perspective on the topic emerges, resolving some of the conflicting information. Searches may be conducted to verify the working hypotheses. A change in feelings is experienced, with uncertainty reducing and confidence growing. Unfortunately, half of the study participants did not show evidence of successfully reaching a focused perspective at any time during their search process.
- Collection: At this stage, the search system is most productively useful for the participant, since the task is to gather information related to a focused topic. Searches are used to find information to define, extend, and support the focus. Relevance judgments become more accurate, and feelings of confidence continue to increase.
- Presentation: In this phase, the final searches are done; searches should be returning information that is either redundant with what has been seen before or of diminishing relevance. The participants commonly experience feelings of relief and satisfaction if the search went well, or disappointment if not.

These stages characterise changes in searches over time for a deep and complex information need and are not essentially illustrative of more or less heavy tasks. These studies also mirror the involvements of students doing obligatory, inspiring tasks. It is likely that the feelings of uneasiness reported might not be detected in other information-intensive task settings. Furthermore, the tools used by Kuhlthau's students were perhaps less familiar and functioning than search tools obtainable today.

2.5.4 Information-seeking as a strategic process

Järvelin and Wilson (2003) discussed the functions of conceptual models in scientific research in information science and research and concluded that some models are of a summary type and others more analytic. The analytic framework involved the following steps (Järvelin & Wilson, 2003 citing Ellis 1989):

- Starting: the means employed by the user to begin seeking information, e.g. asking some knowledgeable colleague;
- Chaining: following footnotes and citations in known material or 'forward' chaining from known items through citation indexes;
- Browsing: 'semi-directed or semi structured searching';
- Differentiating: using known differences in information sources as a way of filtering the amount of information obtained;
- Monitoring: keeping up to-date or current awareness searching;
- Extracting: selectively identifying relevant material in an information source;
- Verifying: checking the accuracy of information; and ending: 'tying up loose ends' through a final search.

Aforo and Lamptey (2012) investigated the information-seeking habits of social scientists working in Haryana's universities. They observed that the majority of social scientists use the library on a daily basis to find the knowledge they need. Information search activities included indexing and abstracting periodicals and citations in articles, respectively. In addition, current journals were preferred to books.

Cothey (2002) looked at how 206 college students used the World Wide Web for information during a 10-month period to get a sense of how the broader public uses the Internet. The author stated that as users of the World Wide Web gain more experience, they have grown more passive and eclectic. They also utilise few searching techniques, according to the findings. Their Web usage, on the other hand, was more inconsistent, which could indicate higher selectivity.

Understanding the information needs with respect to ICT and library resources of university students will be a timely information for managers in public institutions, who invest in literature materials and search tools to enhance students' learning and research. Libraries, whether automated or not, remain the major facilities that students depend on for information. A major

function of information managers in institutions is to provide the appropriate literature materials and search tools to enhance students learning and research (Kattoua, Al-Lozi & Alrowwad, 2016). Therefore, the knowledge of information-seeking needs and behaviour of students is paramount to library managers, as this will enable them implement sound information management practices, which address students' information needs well. This study, therefore, sought to explore the kind of information university students' use, their purpose of information-seeking, the problems they face while seeking and using information, and investigates information systems such as library and ICT resources.

2.5.5 Sense-making

Sense-making refers to an iterative process of formulating a conceptual representation from a large volume of information (Olteanu, 2020; Yoon & Chung, 2017). This process could be part of a larger information search process. Search plays only one part in this process; some sense-making activities involve search throughout, while others consist of doing a batch of search followed by a batch of analysis and synthesis. Numerous studies have clarified the different constituents of sense-making. For instance, a significant study by Cowley, Nowell and Scholtz (2005) in tandem with Wright, Schroh, Proulx, Skaburskis and Cort (2006) outlines activities in a stimulated tasked environment as searching and reading results listings and documents themselves (using Web browser) saving references and analysing them (using word processor) and organising files and directories and using the desktop (using the file system). The undergraduate students such as those at UCC are frequently faced with the tasks of assignments, research and so on (Howlader & Islam, 2019).

2.6 Means of improving information-seeking strategies

Discovering ways of intercepting the obstacles to information-seeking is one of the solutions to improve the students' information-seeking behaviour. It becomes imperative for researchers in this regard to contact students in information institutions. This could be done either through reference interviews or bibliographic instruction sessions. Bell (2017) acknowledges that modes of informing are specific to each person's concern as are the topics they want to be informed about. Scholars like Hurdeman and Kamps (2020) note that libraries in the past sought to accommodate this need by promoting current awareness services (CAS) and selective dissemination of information (SDI) either through print or electronic means. These are user outreach avenues, which can still be optimally utilised in addition to customising access points in accordance with user

interests using the internet or intranet. In analysing and contrasting the bibliographic instruction research procedures provided to students and the approaches that students employed in finding information, Hurdeman and Kamps (2020) concluded that students should not be allowed to fend for themselves. The importance of library skills should be considered in the context of the research process.

Consequently, this suggests that tertiary students' perceptions of library staff's services have the ability to affect their library activities or inactions. As a result, publicising or informing students could be a game changer, as both the institution and the library have a responsibility to promote not only what resources are available. However, how these resources can be used, as well as which sessions are available at what times can help students learn how to use these information-related resources (Deng & Liu, 2017). It is important to note that, despite the above-mentioned information and training sessions, there are some challenges to be aware of, such as students being more concerned with the quantity and coverage of available information resources rather than the quality, accuracy and reliability of those resources (Delaney & Bates, 2018).

Studies have shown that students are more concerned about the amount and the coverage of information contained in the sources rather than their quality, accuracy and reliability (Hong & Injeong, 2017). This has necessitated the employment of effective and efficient ways to improve students' information literacy skills. Based on the results of these authors' study, a popular suggestion from many academics in this regard has been the incorporation of information literacy training into course curriculum (Bruce & Chesterton, 2002; Bruce, Jones & Dumais, 2004; Ebert-May, Batzli & Lim, 2003; Hong & Injeong, 2017). The implementation of this strategy demands a strong partnership between instructors and librarians (Kim & Shumaker, 2015; Huffman, Shaw & Thompson, 2020). Instructors in the aforementioned sentence are experts in their field of knowledge, whereas university librarians are also trained in information literacy to enable them to provide useful resources and services for students. A successful execution of this strategy would not only augment the students' understanding of content knowledge of information they obtain but also their enthusiasm. According to Yang and Zhuang (2020), it is very crucial and significant for users to recognize and apprehend why and the correct time information is needed to elude wasting time when seeking for information.

2.7 Conclusion

This chapter concentrated on information-seeking to show that it is an information activity which illustrates a guiding information-seeking structure for the empirical constituent of this research study. The exchange of views and deliberations in this chapter attempted to show that information-seeking is the way individuals look for information and use the same to finish an assigned job or task (Manierre, 2015). In addition, it was deduced that the activities that engulf information-seeking are influenced by the specific individual and the context related aspects that make out the need for information. In addition, this chapter concentrated on information in the setting of ICT environment. Most of the surveyed literature explain that the ICT environment has positively helped with the transmission of information in this present globalised world of education. In addition, there was an exploration of the way information is disseminated through the use of ICT. The literature which was surveyed regard to the role of ICT shows that ICT has played an essential role in making sure that information reaches all parts of the world by different users for different tasks. In addition, the reviewed literature on students' information needs and information-seeking revealed that information need is the inseparable interrelationship between information and need. Information is required in in the daily activities of humans in school, play or work situation. Explicitly, information is very important in the success of education of the undergraduate students and that students show their information-seeking behaviour in diverse ways. Also, this chapter identified that information surrounding people and that they spend most of their time in search of information and making decisions on how to use the information to satisfy ones need.

This was followed by available sources of information by students. It was concluded that information is available in a variety of formats and it is very vital to choose and make use of the ones appropriate to ones need. This chapter also highlighted the obstacles of meeting information needs. As part of student life, problems are encountered in the process of seeking information. The actual needs of a student may not tally with what is practically available due to the constraints either within the stock or due to the users' own inability. Problems are often influenced by their perceptions of the library and its programmes. Furthermore, it was deduced that some factors like economic, social and political affects the need for information been satisfied.

Next, Chapter 3 presents the theoretical framework adopted in the study to investigate the research problem.

Chapter Three

Theoretical framework

3.1 Introduction

Chapter Two reviewed the literature on the concept of information, information-seeking and information-seeking behaviour. It discussed the role of the ICT in information dissemination and ways of improving information-seeking strategies. The situation of ICTs within the confines of the Ghana education sector was also discussed. The chapter also provided a discussion on the previous studies on the information-seeking and needs of students and similar concepts. Chapter 3 presents a chosen theoretical framework which served as a lens for the study. Other related frameworks are discussed alongside the chosen framework. It is shown how they connect with it. The chosen framework is also motivated, and it is shown how it is applied in the study.

3.2 Information behaviour models

Under this section, various research frameworks of information needs and seeking behaviour of different types of users are discussed. Frameworks from numerous viewpoints, for example the sense making theory (Dervin, 2015), cognitive execution-evaluation model (Norman, 1988), behavioural model of information strategies by Ellis (1989), Berry-Picking (the Dynamic) model of information-seeking (Bates, 1989), information search in electronic environments (Marchionini, 1995), information search process (Kuhlthau, 1991), problem solving (Wilson, 1999) and the standard model of search process (Broder, 2002) amongst others, have been applied by researchers on information-seeking behaviour. Some of the models have been re-examined after careful study of the contemporary developments in the information technology field. These information environments and services are dynamic (Kuhlthau, Heinström & Todd, 2008; McCay-Peet & Toms, 2017) due to the rapid advances and influences of information technology.

3.2.1 Broder's Standard Model

Broder's (2002) standard model of the search process as explained by Sutcliffe and Ennis (1998) depicts a cycle consisting of four main activities, i.e., problem identification, articulation of information need(s), query formulation and results evaluation. Figure 3.1 shows the standard model of the search process.

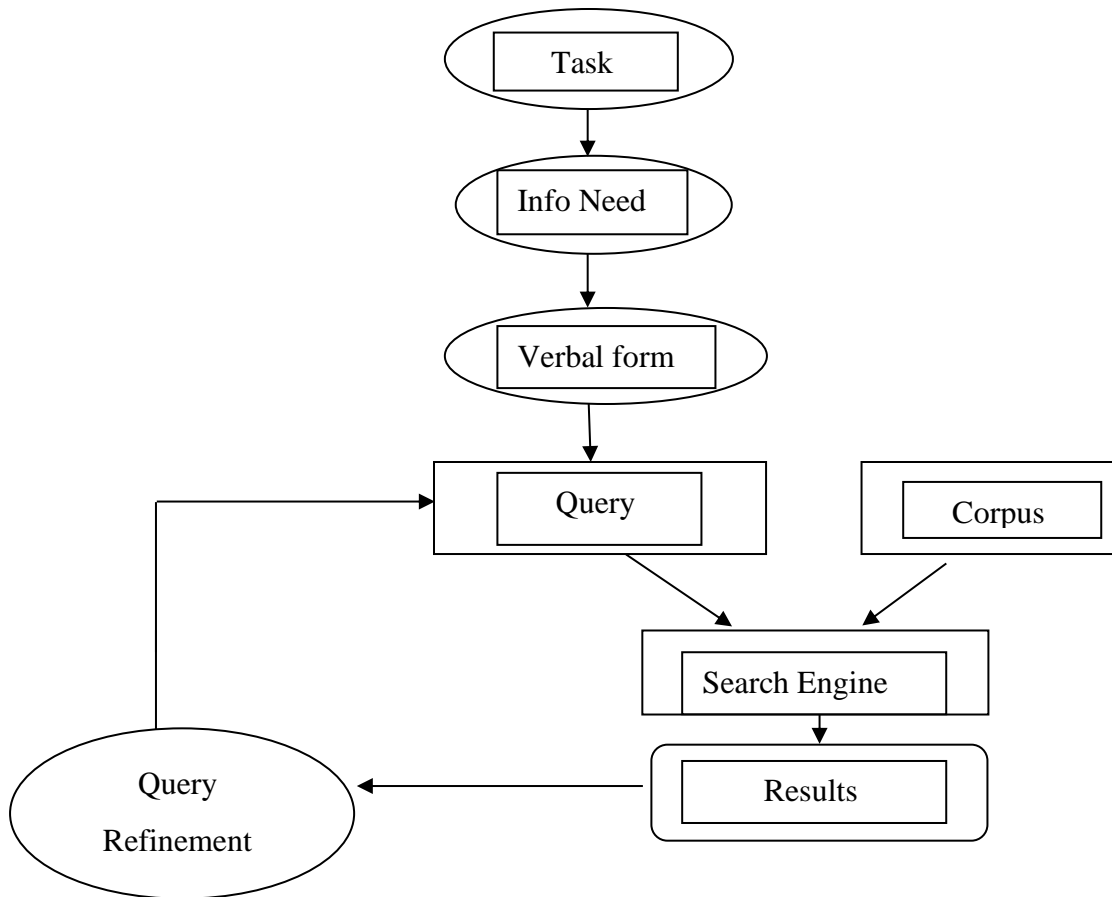


Figure 3.1: The standard model of the search process (adopted from Broder, 2002)

The model in Figure 3.1 illustrates the information access system that is used within the information search process. The process begins with the assignment at hand (task), followed by the recognition of need for information pertaining the task, an articulation of the associated information need (verbalised form) prior to an information search, retrieval and evaluation system. It depicts how Standard Web search engines back query requirement, scrutiny of recovery results, and to some point, query reformulation. Corpus here represents documents or a collection of written or spoken material stored on a computer. Search engines access information from corpus-based on inputted queries.

Sutcliffe and Ennis (1998) links different kinds of search approaches with each of these activities of Brooder’s model (for example, scanning titles is connected with results evaluation). Their model also considers the role of the searcher's knowledge, the system, the collection of information and of searching in general. Shneiderman, Byrd and Croft (1997), who formed the key steps as query formulation, action (running the query), review of results and refinement, describe a comparable

four-phase framework. In addition, Broder’s model brings focus on the uses of web searching as a method for seeking information.

Information-seeking process consists of eight aspects (White, Marchionini & Muresan, 2008) (Refer Section 3.2.7). These models are primarily based on the observations of people engaged in information-seeking processes. Accordingly, UCC students as information users learn during the search process. They scan information, read the titles in result sets, read the retrieved documents themselves, view lists of topics related to their query terms, and navigate within hyperlinked Web sites (Kwafoa & Imoro, 2020). A cognitive account of the standard model can be derived from Norman's (1988) influential model of general task performance, which presents a broad perspective on how people operate in the world. This model is illustrated in Figure 3.2.

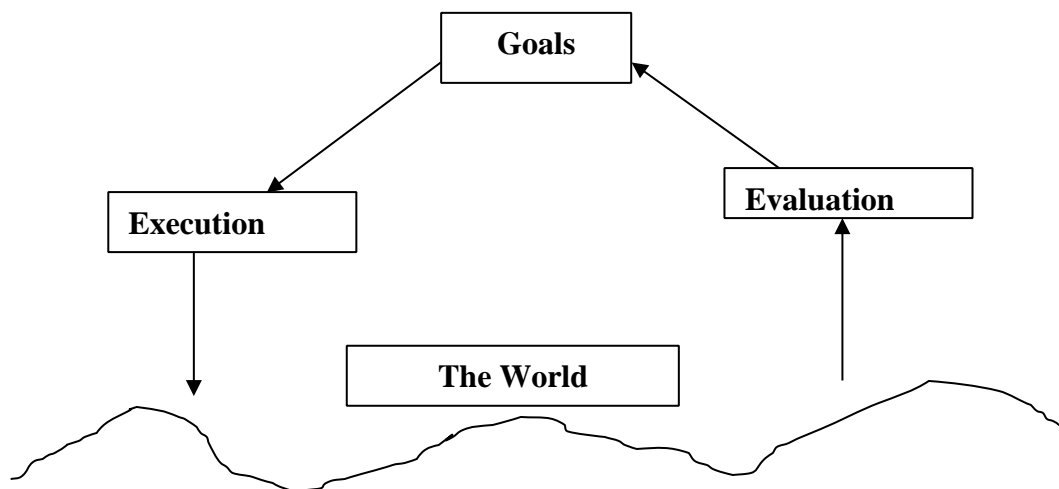


Figure 3.2: A sketch of the cognitive execution-evaluation model (adapted from Norman, 1988)

According to this model, a person must first have a basic idea of the goal to be achieved. Then he or she uses their mental model of the situation to decide on some kind of action in the world that affects themselves, other people, or objects, with the aim of achieving their goal. The notion of a mental model is often invoked in the field of Human Computer Interaction (HCI) as a mechanism for explaining one's understanding of a system or interface. A person's mental model is a dynamic, internal representation of a problem situation or a system which can take inputs from the external world and return predictions of effects for those inputs (Marchionini, 1989).

Norman (1988) divides activity into two categories: execution and appraisal of the outcome. Following an action, a person should assess what kind of change occurred, if any, and whether the

action met the intended aim (Figure 3.2). Norman (1988) refers to the gulf of execution as the gap between what was planned and what was accomplished, and the gulf of assessment as the confrontation with determining whether one's objectives have been met. The fewer these chasms are in user interface design, the more useable the system becomes. This also implies that the less information a person has about their activity, the less competent they will be at formulating goals and evaluating outcomes (Hearst, 2011).

Norman's model might be thought of as providing the cognitive foundations for the standard model stated before. Recognizing a need for information is similar to forming and realizing a goal. The execution actions include formulating the problem and representing the information need through queries or exploration in a search system and the assessment component of the model is examining the results to see if the information need is met. If the gap between the aim and the state of the world is too wide, query reformulation is required (Hearst, 2011).

3.2.2 Dervin's theory of sense-making

Dervin (2005) describes his sense-making theory as a generalised technique for thinking about and analysing human sense creation and "sense unmaking" in its various manifestations. The theory (Dervin, 2005; Salvador-Oliván, Marco-Cuenca & Arquero-Avilés, 2019) is based on a basic set of philosophical questions about the nature of information, the meaning of human sense-making (and "sense unmaking"), which ensure a specified set of procedural actions (Dervin, 2005). Information is characterised as a product of, and "fodder" for sense making and "sense unmaking" within the sense-making theory (Dervin, 1998; Akbari-Zardkhaneh, Fatollahi & Zandi, 2019). Communication is conceptualised as gap-bridging in the sense-making theory, with each new occurrence in time-space necessitating another gap-bridging step. Irrespective of whether the gap-bridging action is routine and unconscious, inconsistent and accidental, or designed and premeditated (Dervin, 1998). Time-space events have the capacity to influence gap-bridging, but they must be anchored in certain situations with specific structural arrangements, experiential scopes, and power or energy flows (Afshar, Tahmasebi Limooni & Ghiasi, 2019). As information users move from one time space moment to the next, gap-bridging can be understood as potentially reactive and resistant to changing conditions (Dervin, 1998; 2005; Ingwersen & Järvelin, 2005; Salvador-Oliván et al., 2019).

Detecting the gaps is not always easy (Savolainen, 1993); people may find it difficult to define the gaps in detail, or they may assess the extent of the gap differently from others. In the presentation

or appraisal of his or her information gaps, on the other hand, the same individual can be highly stiff or very supple depending on the situation. In sense-making research, as some authors have emphasised, equal emphasis should be made to both "human rigidities and flexibilities" when it comes to information-seeking and usage (Dervin, 1992; Chang & Huang, 2020). Sense-making is both a theoretical and a procedural approach to studying information utilisation behaviour. Sense-making is a procedural approach that provides a collection of research methodologies and communication activities (Dervin, 1999a; Dervin & Nilan, 1986; Chang & Huang, 2020). The sense-making approach can lead to a line of inquiry that reveals the nature of a difficult issue, the amount to which information aids in bridging the gap of ambiguity, and the nature of the results from information use (Wilson, 1999; Afshar, Tahmasebi & Ghiasi, 2019). This shifts the focus of research from information sources to information consumers, providing a fresh perspective on the social utilisation of information and information systems (Savolainen, 1993; Dalrymple, 2001; Tidline, 2005; Afshar et al., 2019).

The sense-making approach is based on the premise that human usage of information and information systems should be investigated from the user's perspective rather than the observer's (Dervin, 1992; Salvador-Oliván et al., 2019). The person, rather than a user group's collective understanding, is the centre of attention (Tidline, 2005). When used regularly in 'micro-moment or time-line interviews,' sense-making questions can lead to insights that can impact information service design and delivery. In this way, the approach opens up new avenues for inquiry by allowing the researcher to ask: Under what circumstances would habit or consistency be found across time space versus time-space anchored situational variation? (Zhang & Soergel, Zhang & Soergel, 2020). As a result, sense-making studies can reveal when external influences (such as economics or infrastructure) limit information behaviour. However, according to Dervin (2005), it would be impossible to investigate the demographic characteristics of consumers in this case. These qualities in sense-making are "indices of societal imposed structural conditions," according to Dervin (2005:28).

3.2.3 Ellis model of information-seeking behaviour

Ellis (1989) first presented his model of information-seeking behaviour in 1984. Ever since, other groups of researchers, including engineers, have used the model in information-seeking investigations. Ellis (1989) identified eight general characteristics of social scientists' information-seeking practices. Later, Ellis expanded his efforts to include philosophers, chemists and technologists. Figure 3.3 is a stage process version of Ellis' model.

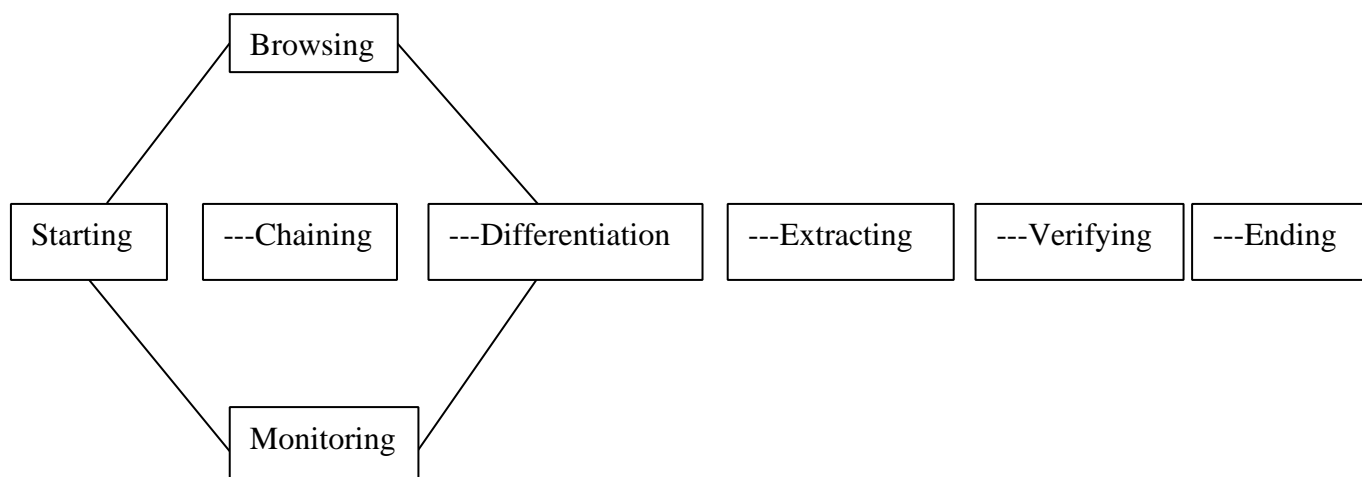


Figure 3.3: A stage process version of behavioural framework (Ellis, 1989)

Ellis' model of information-seeking behaviour comprises eight characteristics. These represent the types of activities but not the stages that the users of information systems might want to achieve via the systems (Ellis, 1989). In addition, they do not directly provide any design stipulations for the systems. The characteristics are listed as starting, browsing, chaining, monitoring, differentiating, extracting, filtering or verifying and ending. The surveying or starting action is typical of the initial search for information (Shah & Paul, 2020). It encompasses recognising the initial materials to search through and choice starting points for the search. Browsing comprises a semi-directed searching in an area of potential interest as a monitoring activity going through the scanning of journals and tables of contents and so on, to find something of particular interest (Garg, 2016). According to Ellis (1989) during chaining, the information seeker follows the chains of citations or other forms of referential association between materials to recognise new sources of information. Chaining can be forwarded where the user is looking for new sources that refer to the initial source or follows footnotes and citations in an information source (Ellis, 1989). At the differentiation stage, the user ranks the information sources based on their importance and value to his or her information need (Ellis, 1989).

The monitoring stage involves the seeker searching for the information for up-to-date awareness purposes. He/she maintains an awareness of developments in his field of interest through the monitoring of sources. The filtering phase involves the use of certain standards when searching for information to make the information as important and accurate as possible. This is mainly done through the computerised literature search (Savolainen, 2017). The user thoroughly works through

a particular source to locate the material of interest in the extracting mode. Thus, selective identification of relevant material in information source and represents a major feature of the information-seeking patterns of many researchers (Kundu, 2017). The ending phase involves 'tying up the loose ends' through a final search.

Thani (2011) supports Ellis' model of information-seeking as a starting point for thinking about how to create solutions that help information users. Its goal is to provide a foundation for making decisions. Later, Ellis' model was re-evaluated, and new properties were incorporated to it (Meho & Tibbo, 2003). In addition to the four factors established by Ellis, the current model adds four more to provide a more thorough picture of the information-seeking process of social researchers examining stateless countries. Accessing, networking, verifying and controlling information are among the new features. Meho and Tibbo (2003) provide eight elements for the Ellis model in a subsequent study: starting, chaining, browsing, differentiating, monitoring extracting, verifying, and finishing. The last two elements have been added to Meho's model and implemented. Ellis' model is strong since it is supported by the empirical research and has been tested in other investigations. Although Ellis' information-seeking behaviour is believed to be based on academic and research investigations, the categories of information-seeking behaviour may also apply to other types of users. The information-seeking paradigm proposed by Ellis is thought to suit any kinds of information-seeking.

3.2.4 Ingwersen' s cognitive model

From the perspective of the collaboration of users with information retrieval (IR) systems, Ingwersen' s (1995:69) cognitive model which concentrates on identifying processes of cognition may occur in all the information processing elements involved. Ingwersen' s model is slightly simplified. Ingwersen' s model resembles other models of information-seeking behaviour, though it is slightly streamlined (Skov, Järvelin & Ingwersen, 2018). The features used in cognitive space and social / organisational environment, resembles the person in context and environmental factors specified in Wilson' s (1999) models. The general direction towards the queries posed to an IR system indicate a concern with the active search; a worry of most information-seeking models (Harman, 2019). Clarifying the issue, Ingwersen demonstrates that within each area of his model, the functions of the information user, the document author, the intermediary, the interface and the IR system are the result of explicit or implicit cognitive models of the domain of interest at that point (Skov et al., 2018). Hence, users have models of their information need, their difficulty or aim. This is usually implied, but often capable of clarification.

Yet again, the IR system is an explication of the system designer's cognitive model of what the system should do and how it should function. Next, Ingwersen focuses on the IR system, proposing that an all-inclusive model of information-seeking behaviour should include the system that indicates the information objects that may be of interest to the enquirer. Finally, the author shows how different cognitive transformations occur when a user encounters a problem or sets a goal, resulting in a circumstance where a store of pointers to information items may be satisfactorily searched and valuable objects found. Finally, the author emphasizes the importance of properly communicating these models or cognitive structures, as well as their transformations, throughout the 'system,' which will include the user, the author, and the IR system designer. As a result, Ingwersen's model, to some extent, combines notions about information behaviour and information demands with challenges of IR system design, and this, together with the model's focus on cognitive structures and the concept of polyrepresentation, is a key strength (Wilson, 1999). It is proposed to describe the current user's information demand, problem state, domain work task or desire in a causality structure using polyrepresentation, and also to embody semantic full-text elements using the notion of 'deliberate redundancy' (Ingwersen 1994). Figure 3.4 shows the cognitive model of Ingwersen (1995).

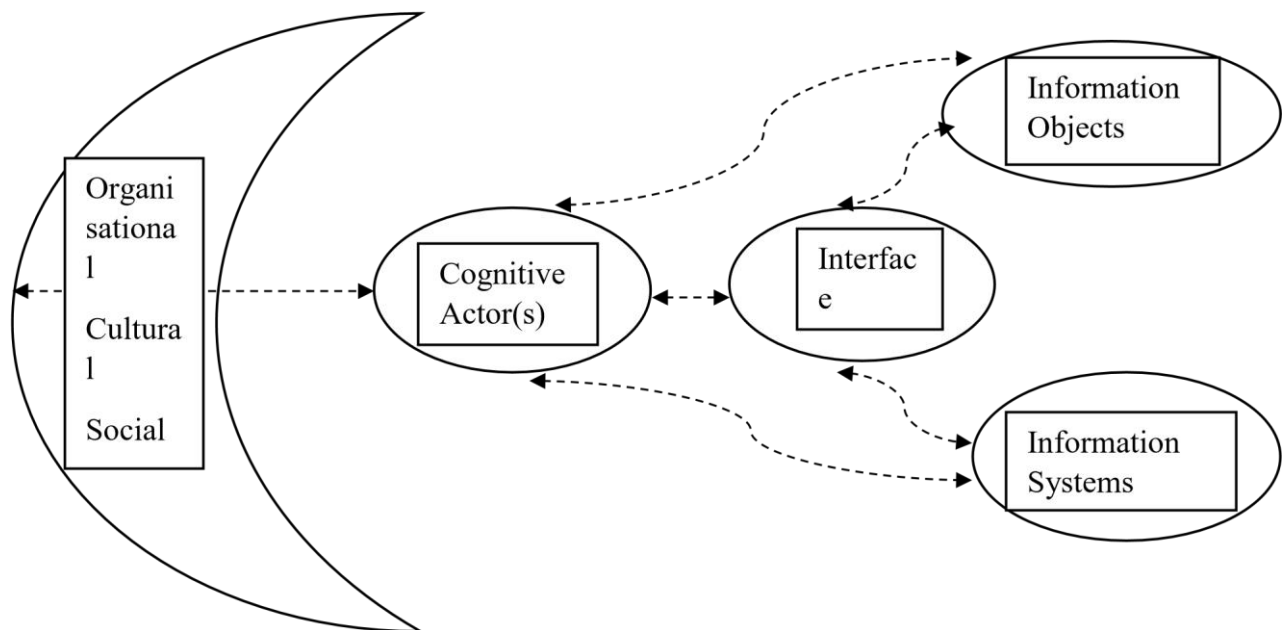


Figure 3.4: The cognitive model (Ingwersen, 1995)

3.2.5 Model of the information search process

In the 1980s came the formulation of Kuhlthau's (2013) model of the information search process (ISP). The model was adjusted and refined in the 1990s and then re-examined in 2008. Kuhlthau (1988) elucidated ideal strategies employed by students of information search as the fragment of

the writing procedure. The model encompasses two standpoints, mental and emotional viewpoints and was created via remarks and dialogs with students over a very long period (Haley & Clough, 2017). The successions of research conducted by Kuhlthau led to the formulation of a new model of the research process namely ISP, a model based on an interior viewpoint. The author mentions that the improvement of the theoretical outline has been in existence in empirical research for over twenty years (Wu, Dang, He & Bi, 2017). This commenced with study of students via qualitative approach and then engaging an early model which was confirmed and polished via quantitative and longitudinal studies involving various library users. This was additionally advanced in case studies of individuals in the place of work. The model has since its creation and improvement been useful for comprehending the information search involvement of individuals in an extensive diversity of library systems.

Robson and Robinson (2013) note that the advancement of theory relies heavily on models in that they are a kind of proto theory, a tentatively proposed set of associations, which can then be verified for soundness. The viewpoints of library users, initially students, formed the foundation for Kuhlthau's ISP model. Bapte (2017) argues that personal concept theory is an idea about the move from lack of knowledge and how an individual may aim to go beyond his / her own dogmatism. Shah and Gonzalez-Ibanez (2010) assert that Kuhlthau's model is one of the best models of information-seeking that elaborately shows a user's viewpoint. Again, Pettigrew, Fidel and Bruce (2001:49) echo that Kuhlthau's model is a "landmark study" which enlightens or set the pace for researchers "within the cognitive framework". Wilson (1999) postulates that this model is universal than that of Ellis in presenting awareness to the emotional state associated with the various stages and activities.

Considering this, Kuhlthau recognised her commitment to Kelly's personal construct theory (Kelly, 1955) which "describes the effective experience of individuals involved in the process of constructing meaning from the information they encounter" (Kwasnik, 1991:364). According to Fidel (1993), Kuhlthau's model is very important and an all-inclusive research that took into consideration three vital realms: the sentimental area (feelings), the mental (thoughts) and the physical or somatic area (actions) that are mostly recognize to each stage of the information search process. Ingwersen and Jarvelin (2005:83) state that the model has been used in several recent empirical studies that have to do with Web information retrieval and many more. On the other hand, Meyer Fisher, and Marcoux (2009) scrutinised the model and argued that there is still much discussion on what factors effect information search behaviour.

According to Shah (2017), the ISP describes information-seeking as a process of creation susceptible to Kelly's personal idea theory, since data augmented indecision in the earliest phases of the information-seeking process. A succession of point of views, emotional states, and activities are the three factors described by Kuhlthau's ISP model as users' involvement in the information-seeking procedure. The ISP by Kuhlthau illustrates an all-inclusive interpretation of information-seeking from the user's viewpoint in six phases. These are task initiation, selection, exploration, focus formulation, collection and presentation. Figure 3.5 presents Kuhlthau's model.

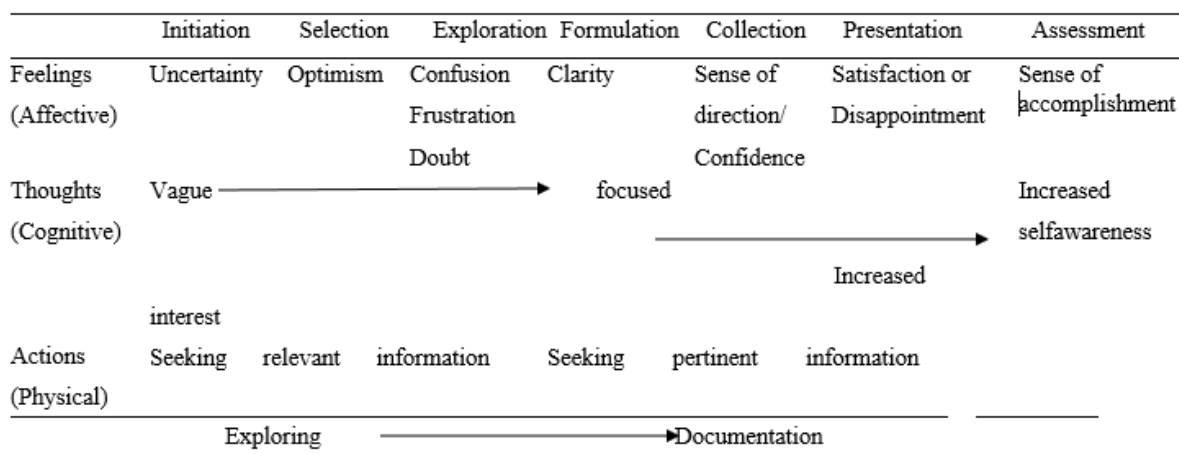


Figure 3.5: Information search process (Kuhlthau, 2013)

Initiation: This is the stage where the information seeker realises his/her information needs. This is typified by a student who has been given assignments to work on showing the realisation of the need for information to complete the given assignment. A case where the student is unable to complete the assignment lies solely on his or her own knowledge coupled with seeming apprehension and indecision.

Selection: The information seeker must have understood well the anticipated information prior to that instance he/she starts searching information. In addition, the problem is recognised at this stage. The recognition of the problem enhances the seekers' hope of finding the information he/she is searching for. Once the information is found, the inherent confusion in the mind of the seeker disappears.

Exploration: A stage that determines the fate of the seeker, thus whether the seeker would be successful or not. At this stage, the seeker is challenged with abundant information to select from which could however once more bring about the situation of indecision and as well a state of

sureness. Obviously, a situation like this is reliant on the searcher's comprehension of his or her problem zone.

Formulation: At this stage, the seeker gets clarification that aids him or her to understand the information resources at hand and the way to handle his or her topic. Thus, the information found can aid in diminishing anxieties within the information seeker and increase his or her self-assurance as well.

Collection: Here the knowledge of the subject area is increased since the user now has relevant information necessary for the defined topic. Therefore, the interest, energy and involvement of the user for the task deepens. Unless the earlier stages have been executed well, this stage would not be reached. Once this stage is attained, the implication is that the quest of the information seeker was fruitful and efficacious.

Presentation: In this concluding phase, the seeker is now showing or presenting the information found. The stage comes with the opportunity for the seeker to be able to evaluate if his or her information-seeking expedition was successful or not. Once a journey is deemed successful for a seeker, it undeniably implies that the phases would be recurring for information-seeking aims. Likewise, students in tertiary institutions like UCC will go on and on with information search processes once they are not satisfied with their search results for their assignments and research works. The study will zero in on the consistencies on an assessment of results of information search activities by these students.

Assessment: This gives a sense of accomplishment and increases self-awareness achieved through a positive and conclusive information search. However, an information search that is not conclusive will not yield a sense of accomplishment nor increase self-awareness.

3.2.6 Wilson's 1999 model of information-seeking behaviour

Wilson's (1981) model of information-seeking behaviour has the same basic framework as his 1996 model. Wilson (1981) drew on studies from a wide range of disciplines, not just information science. Decision-making theory, psychology, innovation, health communication, and consumer research are some of these fields (Kumbar, 2014). The cycle of information activities is depicted in the model, from the emergence of the information need (context of information need) to the phase of information use (information processing and use).

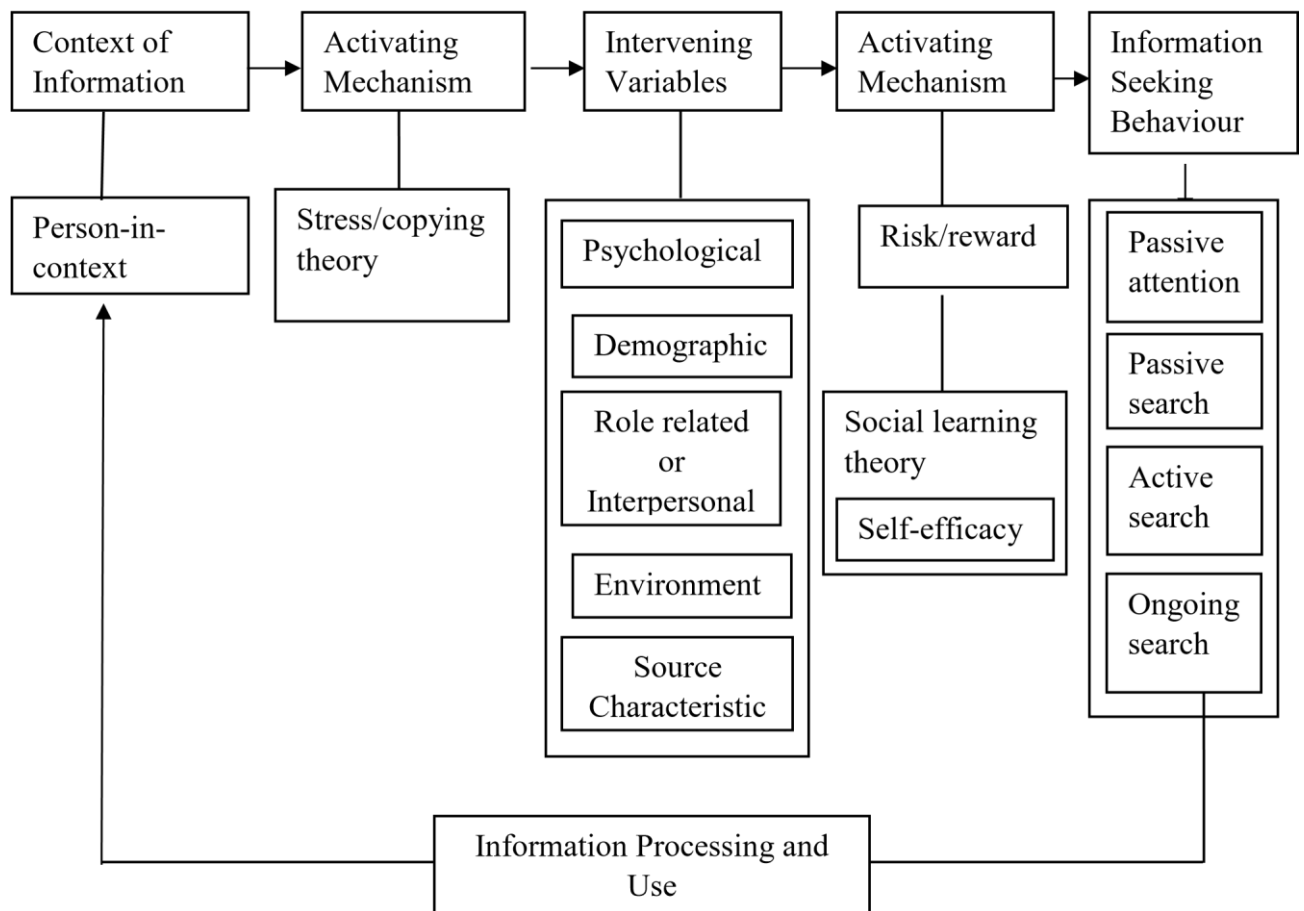


Figure 3.6: Model of information-seeking behaviour (Wilson, 1999:257)

The intervening variables now reflect the information-seeking hurdles, as shown in figure 3.6's third group of concepts (mental, segment of the population, role-related or interpersonal, geographical, and source characteristics). In the sixth group of concepts in the illustration, the model now recognises information-seeking behaviour (passive attention, passive search, active search and ongoing search). It is proposed that the impact of intervening variables may promote and inhibit information usage, despite the fact that information-seeking behaviour encompasses more types than those specified in the 1981 model (Wilson, 2016). Information processing and use become such an important aspect of the feedback loop displayed at the bottom of the model if information needs are to be met. Three significant theoretical notions are also presented as activation processes in the 1996 model to explain user behaviour. These mechanisms are represented by stress/coping, risk/reward, social learning theory and self-efficacy in the second and fourth groups of concepts in figure 3.2. The activation mechanisms are psychological factors that these various theories explain and that encourage the user to continue with the information-seeking activity. This model reflects what appears to be the precise demands and processes of

students' information-seeking behaviour (Wilson, 2016). However, the behaviour of students in the researched situation in this study remains an open question.

Wilson's revision of his model in 1994 was built on his novel model for the purpose of comprehending the social subtleties of the user (Al Shboul & Abrizah, 2016), for instance, individual situation, societal role and ecological setting which demands that an information need is generated. However, Wilson (1999) argues that lots of models that explains information behaviour are mostly in the form of statements which are shown as illustrations best describes information-seeking action, the sources and costs of that action or the associations among phases in information-seeking behaviour.

3.2.7 Marchionini's model for information-seeking in electronic environments

A strong focus in this study is electronic methods of information-seeking which therefore necessitates the requisite for informed and suitable models. Research makes it known that most of the models were framed during the period when electronic procedures of information-seeking were unacquainted and still developing (Adebayo, Rawat, Njilla & Kamhoua, 2019). Al-Suqri (2011:2) mentions that there is a requisite for contemporary research which considers the impact of the main technological progresses of modern years typified by the Internet. How relevant such models are to the current technology-driven learning is what researching students' information-seeking behaviour can confirm or disconfirm. The fundamental framework in this study is the information-seeking model by Marchionini (1995). The choice is based on the fact that it exemplifies information-seeking in electronic surroundings, which is narrowly applicable to the aim of this study.

Marchionini (1989) notes that information-seeking is an exceptional situation of problem solving comprising a few stages, beginning from the acknowledgment of the difficulty or problem to appraising the results. Marchionini's search processes are suitable for this study, in that students of today are profoundly involved with the electronic setting. Marchionini (1995; 2019) puts forward eight phases: recognise and accepting an information problem, delineate and comprehend the problem, select a search system, frame a query, perform search, scrutinise results, source information, and reflect/iterate/stop.

Information-seeking commences with recognition and accepting that a problem exists and that this problem will remain unless it is fixed or else an individual will discard the assignment of obtaining

the necessary information (Marchionini, 1995; Berget, MacFarlane & Pharo, 2020). Figure 3.7 shows Marchionini’s information-seeking model. That is followed by a brief explanation of each step.

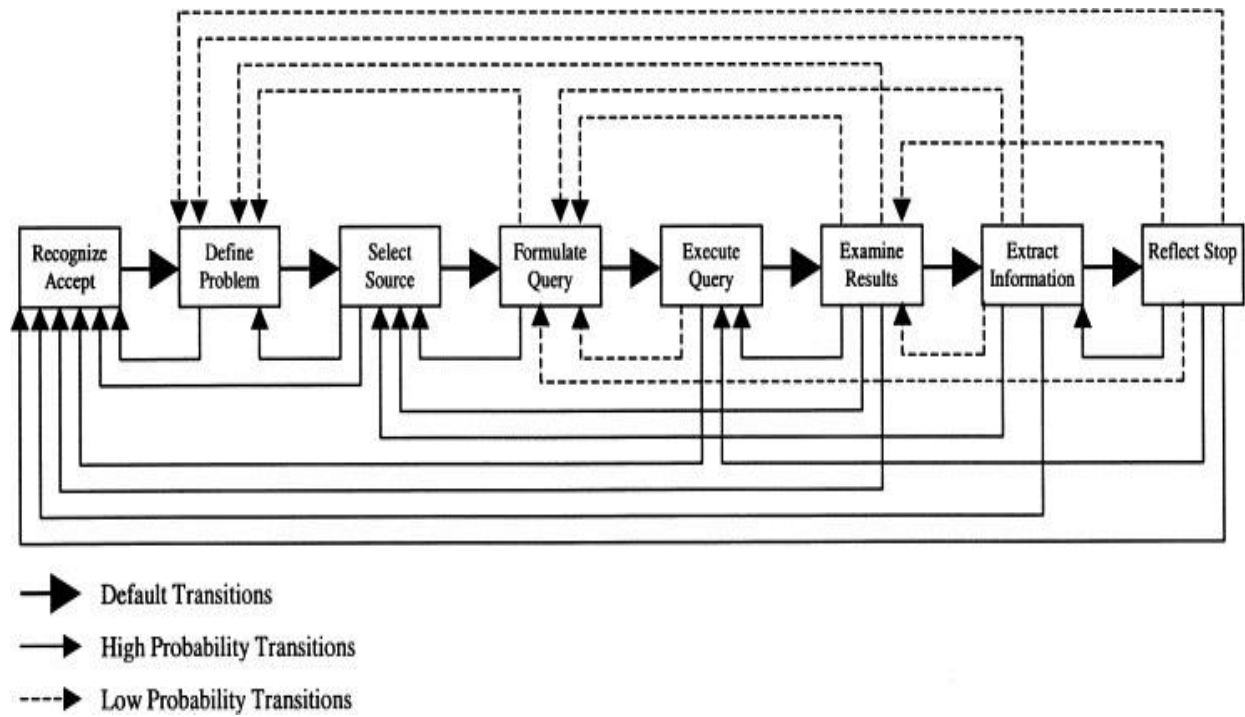


Figure 3.7: Information-seeking model (Marchionini, 1995:51)

3.2.7.1 Recognition and acceptance of an information problem

Recognising and identifying an information problem may be triggered by a variety of factors, one of which Marchionini (1995; 2019) believes has to do with internal motivation of the information seeker. An implication for the current study could be that UCC students with their usual tasks of assignments come to points of realisation that these assignments cannot be done on their own knowledge alone and therefore accept that there is an information problem which requires information where the latter (information) is referred to as the problem solver. Osborn, Dozier, Peterson, Bullock-Yowell, Saunders, and Sampson, (2018) assert that a problem preparation action come prior to admittance of the problem and encompasses the information seeker conceptualising the limits of the information need, picturing the type of information that will address the need. Studies illustrate that approval is subjective to familiarity with the task area, by the background, through the acquaintance of search systems, and by the sureness of information seeker in his or her private information set-up (Huang, 2014; Ma, Stahl & Knotts, 2018). For that reason, an

information searcher will ponder on the information problem prior to defining and understanding precisely what is his or her information problem in the next phase.

The education students at UCC could be going through the steps recognised by Marchionini. However, there could be fundamental influences as Marchionini (1995; 2019) further argues that the problem may be bottled up or acknowledged. The suppression of the problem could be ascribed to several factors such as, “how costly is it?”, “where do I begin?” and consequently an information seeker may end up discouraged about his or her search. UCC like most tertiary institutions, has laid down measures to aid students to have easy access to numerous e-resources within its libraries. This is a way, i.e., removing cost and misunderstanding as to where to commence. However, a study such as the current one could help to explain the students’ information-seeking behaviour in response to the mechanisms or systems that the university has put in place.

3.2.7.2 Definition and understanding of the problem

Understanding depends on the information of the task domain and this may also be subjective to the situation. The cognitive processes lead to a delineation of the problem which is expressed as an information-seeking task. In the case of intermediated information-seeking, the transitional conduct a reference interview to achieve this subprocess (Savolainen, 2016). In end-user searching, this step is often assumed or abbreviated, a major cause of end user frustration and failure. Marchionini (1995; 2019) ascertains that knowing and outlining an information problem precedes information-seeking. This phase is deemed crucial because it remains active if information-seeking progresses. In other words, this phase can be returned to every now and then. The author further asserts that to comprehend and delineate the problem, it must be restricted, categorised and a setting for the answer to be ascertained. An implied assumption here for the UCC students under study regarding their information-seeking behaviour is that their definition of an information problem could be exclusively reliant on their comprehension of the information as information seekers. At the problem delineation phase, the information seeker denotes the problem within as a task with characteristics that permit advancement to be evaluated and ascertains a common approach to use for succeeding phases (Marchionini, 1995; 2019). A quest of the current study is to find out properties within the task of information problem of the UCC students that permit the evaluation of the search progress and as well the establishment of a basic approach to use for subsequent steps.

3.2.7.3 Choice of the system

Marchionini (1995; 2019) states that the phase of selecting a search system is reliant on the information seeker's preceding involvement with the task area, the range of his or her personal information organisation and the anticipations about the result that may have been fashioned during problem delineation and task improvement. The process of choosing a search system (e.g., database management system (DBMS)) and focusing searching relies on the knowledge of content. In this case, database refers to a collection of related data that are stored in a manner that enables information to be retrieved as needed. DBMS is the type of software programs used to create, maintain and access databases. An advantage for the information seeker is knowledge of the content in that this has the potential of aiding him or her to the location of information and relevant information as well, for instance, in the arena of educational studies, the Institute of Education Sciences (IES) of the U.S. Department of Education namely, Education Resources Information Center (ERIC) an ideal model database. This database is an online digital library of education research and information. The database offers an all-inclusive, user-friendly, searchable, Internet-based bibliographic and full-text database of education research and information for educators, researchers and the public. ERIC usually includes education-related articles in its database. Access to this database helps to improve teaching, learning and educational decision-making.

With this kind of knowledge, the information seeker is advantaged in selecting the appropriate system to solve his or her information problems. In a tertiary environment such as UCC, individual settings, capabilities and involvements could serve as crucial factors influencing the students (information seekers) in choosing the search system. It could be confidently assumed that the students may choose search systems based on the advice of friends or colleagues. However, librarians can also partake in assisting an information seeker to recognise applicable sources and search systems. As part of the roles played by librarians on university campuses, they help the students in identifying pertinent sources and systems.

Marchionini (1995; 2019) asserts that information seekers who visit the library may ask a librarian where to commence searching. This author adds that they may check in an index or a card catalogue, and finally other sources. Accordingly, Marchionini (1992; 2019) maintains that users must select a source of data to commence their search, irrespective of level of clarity of information problem.

3.2.7.4 Formulation of the query

According to Savolainen (2018), this refers to the conclusive instant when feelings of indecision diminish and confidence increase. The query formulation encompasses the identification of concepts and keywords, identification and clarification of broader and narrower terminologies as well as synonyms for each concept. The keyword construction for query preparation comprises corresponding the comprehending of the task with the system chosen. Marchionini (1995; 2019) emphasises that in many circumstances, the initial query formulation recognises an access point to the search system and is followed by browsing and/or enquiry reformulations.

The purpose of considering synonyms and formulating keywords is to discover probable terminologies that would best signify the content as it is explained in the system by means of well-ordered vocabulary, where controlled vocabulary is a set of well-ordered terms used to indicate information at a larger scale. However, Marchionini (1995; 2019) suggests that the problem of signifying concepts in document sets is a vital problem in information science and should be considered from several viewpoints. Accordingly, the information-seeking model developed by Hannigan, Haans, Vakili, Tchalian, Glaser, Wang, Kaplan, and Jennings (2019) primarily to explain the formal research performed to complete class assignment specifies that the inquirer identifies and selects ideas to form a perspective on the topic.

As stated earlier, graduates with information skills and expertise in information searching are thought to obtain more relevant information than graduates without such abilities and knowledge (Thani, 2011). As a result, students will unavoidably need to select relevant information to meet their information demands in order to keep up with the changes and challenges. Graduate students would be left behind by the tremendous growth of knowledge if they did not excel in information-seeking skills. The consequence is that information consumers must be aware of and understand how individuals seek information, as well as the challenges and barriers they will face in the future, in order to cope with their surroundings (Mai, 2016).

Marchionini (1995; 2019) also notes that the mapping role most generally takes words connected with the task onto the set of words that function as entry points to the system content. In this case, words instead of phrases or concepts are used while indexed words or controlled vocabulary serve as entry points. An implication here is that the information seeker's success is reliant on the way the portion of information is indexed and categorised and how well-ordered terms are used in signifying information. An information is probable to be retrievable by information seekers, once

the information is undoubtedly signified with controlled terms, and the seekers use these terms in their search. In agreement, Kuhlthau (2001:25) mentions that the inquirer may read some notes for themes or for selecting and deselecting possible foci. It is usually found of tertiary students such as UCC students to select and deselect possible foci based on notes for themes from lecture notes. Marchionini (2019) notes that electronic systems have contributed enormously to information-seeking at the query preparation stage. It is ostensible in the research that progress in supplementing information seekers' mapping of task vocabulary to system vocabulary has been extra challenging, but the human-computer dialogues and machine inference have generated encouraging directions for assisting semantic mappings (Marchionini, 1995, 2019).

3.2.7.5 Execution of the search

The accomplishment of physical activities to query an information source is controlled by the information seeker's psychological model of the search system (Marchionini, 1995; 2019). Fundamentally, the formulated query is manipulated by imputing the keywords framed via typing into a database or search engine. Marchionini (1995; 2019) established a significant instance of effecting a search, i.e., for a card catalogue, an implementation may involve choosing appropriate drawers and by means of alphabetical ordering rules; for an online database, an implementation may require typing the query and sending same with an exceptional keypress for example return); for a hypertext, an implementation may involve browsing the database by ensuing offered links delivered by the author. Search execution is believed to be a most noticeable change fashioned by electronic settings since information seekers accomplish many controlled physical activities at workplaces relative to those done in offices or libraries (Marchionini, 1995; 2019).

3.2.7.6 Examination of the results

It is imperative for those results obtained by the information seeker through the execution of the query to be examined. Marchionini (1992:158) states that “systems typically respond to queries with sets of ‘hits’ from which the user determines which function to call next (often a call to examine individual records)”. The information seeker at this stage examines the results to measure improvement toward achieving the aim for which the search is done. Marchionini (1995) opines that this scrutiny is reliant on the quantity, type and format of the response and comprises decisions about the importance of information enclosed in the response. Macnamara (2005; 2006) asserts that the inspection of precise items for importance is noticeably influenced by the type (graphic, textual, primary, secondary, numeric, etc.) and the quantity of information in the recovered set.

This activity has the tendency to becoming the most time-consuming activity as people listen to read and view transitional and primary content (Moran & Marchionini, 2012).

Usually, tertiary students “spend most of their search time examining results returned by the search system. The challenge is to first make sense of brief summaries quickly for objects such as scanning snippets or thumbnails to assess potential relevance) and then scan/read/view full objects (e.g., documents, music, video) to understand the content and map this understanding onto the information need. With respect to information-seeking, different perspectives on sense-making have been developed but they tend to focus on making sense of the full objects or situational contexts rather than the summaries provided in results lists” (Marchionini & White, 2010:217).

3.2.7.7 Extraction of information

There is an association powerless of being untangled between adjudging information pertinent and mining the applicable information for all or portion of the problem resolution. For instance, skills for reading, classifying, scanning, listening, printing, copying and storing information are used by an individual to extract information. Marchionini (1995; 2019) states that as soon as pertinent information has been found, users must study, copy, and assimilate this information so that it may be applied to the original problem. Information extracted is worked on and incorporated into the information seeker's understanding of the field (Marchionini, 2019). The significant contributions of electronic tools for cutting and pasting cannot be overemphasised as they at present offer noteworthy benefits for information mining of text, stationary and dynamic images and sound.

3.2.7.8 Reflection/iteration/stop

Information search is regularly accomplished in not less than a solitary query and recovered set. In most situations, the first recovered set functions as response for additional query preparations and implementations. Subsequently, the decision on when and how to repeat the information search necessitates a valuation of the information-seeking process itself, how it shares to the recognition of the problem and the anticipated determination, and how well the mined information maps onto the task (Gunasekera & Balasubramani, 2020). The information seeker's choice to halt or replicate the above phases is reliant on whether he or she acquires the envisioned information or not. Once he or she gets pertinent information he or she may stop but if he or she does not, then repetition commences. Marchionini (1995; 2019) contends that the purpose of an ending role may rest on external roles like background or search system or on interior roles like inspiration, task area knowledge and information-seeking aptitude.

Contrasting other models, information-seeking process by Moran and Marchionini (2012) describes a process rather than independent behaviours of information users. He adds that an information seeker uses skills such as scanning, reading, classifying, listening, copying and storing information to extract information. Thus, his information-seeking model is tuned to information-seeking in electronic environments. Thani (2011) mentions that as information is extracted, it is manipulated and incorporated into the information seeker's knowledge. He also describes the concept of information browsing, as three general types of information, which is considered different from information-seeking process. The three general types of information browsing are described as follows:

- Directed browsing: In this case, browsing is methodical, concerted and directed by a specific target, e.g., scanning a list for known item and verifying information such as dates or attributes.
- Semi-directed browsing: Occurs when the browsing is prognostic or usually purposeful. The target is less definite, and browsing is less systematic.
- Undirected browsing: Occurs when there is no real aim, and it is insufficient focused. Examples include flipping through a magazine and channel-surfing. An information seeker may scan a variety of sources broadly, taking advantage of what is easily reached.

Marchionini (1995; 2019) also cites a number of variables that can influence an information-seeking situation. The information seeker himself, the task, the search system, the domain, the setting, and the outcomes are all examples. He also describes the steps that an information seeker might take when looking for information. He divides them into three primary processes: comprehending, planning, and executing, as well as evaluating and employing them in electronic contexts. He claims that skills like reading, scanning, listening, classifying, coding, and storing information are required to extract information. Information is extracted, processed, and integrated into the knowledge of the information seeker (Thani, 2011).

As a result, information usage begins. He wants us to assume that his theory of information-seeking behavior applies to all instances in which people seek information. However, a detailed examination of Marchionini's (1995; 2019) framework of information-seeking behavior reveals that his (Marchionini's) theory is based on multiple underlying assumptions. As a result, his model of information-seeking is linked to electronic settings (Thani, 2011).

This study demonstrates that different users seek information in different ways. It also reflects the fact that various information resources are housed in diverse locations, forcing users to employ numerous tactics in order to acquire the precise information they seek. As a result, different information-seeking models assist information seekers in obtaining various information-seeking tactics (Thani, 2011). Other useful knowledge relating to users' information-seeking in order to avoid being left behind and to keep up with technological advancements in the information-seeking environment.

Many descriptions of the information-gathering process assume an interaction cycle that begins with identifying a need for information, then move on to query specification, examination of retrieval results, and, if necessary, query reformulation, with the cycle repeating until a satisfactory result set is found (Hearst, 2009). This supports the theory that information-seeking is a subset of issue solving. It entails recognising and interpreting the information problem, devising a search strategy, carrying out the search, analysing the results, and, if necessary, repeating the process (Salton, 1989; Shneiderman et al., 1997).

3.2.8 Research works on Marchionini model

Machionini's model of information-seeking has been applied in various research studies. Whereas some of these studies are in relation to academic libraries others focus on other areas. For instance, Abouserie (2007) studied the information-seeking behaviour of research students in the University of Illinois. Machionini's model was applied by Abouserie (2007) to demonstrate how students particularly research students applied various techniques to find information that is relevant to the research. The study further outlines the process as proposed by Machionini as the ideal procedure for students to follow in their search for information. However, Li, Zhai, Zhou, Fan, Wu, and Ren (2017) asserted that the applicability of the model may differ in relation to context.

The work of Alhenshiri (2013) which studied the user task information gathering on the internet among Canadian university students also applied Machionini's model of information-seeking as its theoretical foundation. Alhenshiri (2013) stated that the information-seeking behaviour of students was engaging and included an individual's ability to understand, plan and execute the information search, and finally evaluate and use the information obtained effectively as suggested by Machionini. Alhenshiri (2013) agrees that the search for information is entirely a cognitive task that requires more attention. Thus, without the ability to apply these mental strategies, information search would not be beneficial.

Kirnile and Khamadi (2015) also studied the relevance reinvention of information professionals in the digital era and applied the Machionini's model of information-seeking. Kirnile and Khamadi (2015) believed that professional in the information management must continue searching for updated and relevant information to in at par with the changes in the digital era. Based on Machionini's model, Kirnile and Khamadi (2015) suggested that these professional must base their current information search on their previous knowledge. With the advent of current technologies and there is the need for professional in information management to have access, evaluate in effectively use information for their benefit and for the benefit of their clients.

Li et al. (2017) also studied the information-seeking behaviour of victims on earthquake in China. The work of Li et al. (2017) is an example of studies that applied Machionini's model of information-seeking outside the academic context. Li et al. (2017) revealed that earthquake victims have poor information-seeking behaviour and this recommended that action should be taken in relation to teaching individual how to effectively search for and use information based on the suggestion of Machionini. Li et al. (2017) emphasised that for information-seeking to be effective, there in the need to understand the kind of information needed, plans, and search from appropriate sources and finally effectively use the acquired information. Li et al. (2017) concluded that better information-seeking behaviour is important for success.

3.3 Criticisms and strength of Marchionini's model

According to Weber, Becker, and Hillmert, (2019) models in the information behaviour field have their own strengths and weaknesses. Marchionini's model is not an exclusion to this rule.

3.3.1 Strengths

According to Berget, MacFarlane, and Pharo (2020). Marchionini's information-seeking model closely describes a formal online search from a cognitive standpoint and is beneficial for articulating the general components of such a search at a high level. Rather than a thorough description of the search, the model is intended to provide an overview of the online information-seeking process. Marchionini's model is the most detailed in describing the causes and conditions of change.

One advantage of this model is that it focuses on each phase of the information-gathering process, making it easier to see possible problems earlier in the process. Savolainen (2018) suggest that individuals will accept additional information needs if search engines are regarded to be effective and easy to use, and that this phase is tied to time constraints. This is linked to those with disabilities who have been reported to take longer while using systems, such as blind people. Marchionini's model, used as a good framework for developing and testing novel combinations of information behaviour constructs and theories with a broad range of individual groups from various parts of the world, shows rigour, significance, and value of the model in a fast-changing landscape of knowledge environment. In addition, the model best shows how individuals search in the electronic environment for information. It has been used widely in different disciplines such as library science, electronic information-seeking and information science (Savolainen, 2018).

3.3.2 Weakness

Berget, MacFarlane and Pharo (2020) add that the information seeker controls these subprocesses, they frequently follow heuristic or opportunistic courses based on abilities and experience. Elgllab and Shehata (2019) points to the fact that these trajectories can be influenced by continuing judgments about the costs and advantages of advancement, as well as judgments about the information collected, which can lead to bias in the information seeker. Savolainen (2016) highlights that if the search results are deemed unacceptable, some or all the preceding subprocesses will also require redefinition and reimplementation. Information searching, like learning and problem solving, requires general cognition, knowledge, and ability, and is impacted by personal attitudes and preferences, according to Marchionini's concept. The need of focusing on information seekers' atypical states of knowledge is critical because information seekers are concerned with a problem, yet the problem and the information required to solve it are not well understood.

Gordon, Meindl, White and Szigeti (2018) criticised that to formulate a search request, information searchers must go through a process of clarification, implying that search systems should allow iterative and interactive discussions with users. In addition, they stated that the information-seeking process model, incorporates several essential characteristics of information-seeking, such as aspects of collection exploration in examine outcomes and aspects of knowledge acquisition in extract information. However, it does not, however, place the same focus on learning and comprehension as exploratory search, and it does not adequately represent search context or information consumption (Zerehsaz, 2017).

3.4 Application of Marchionini model of information behaviour in the study

According to Marchionini (1989), information-seeking is a unique scenario of problem solving comprising a few stages, beginning from the acknowledgement of the difficulty or problem to appraising the results. According to Savolainen (2018), a model describes a link between concepts but is more closely related to the real world. Marchionini's search processes are suitable for this study in that students of today are profoundly involved with electronic setting. Understanding the user, according to Makinde (2018), is half the problem when it comes to offering information services.

In addition, Dervin and Nilan (1986) assert that system-oriented studies have historically not resulted in improvements in the design of information systems, and that many recent studies have focused primarily on user-oriented systems, with the researchers as the information user at the centre of the current study. Figure 3.7 enables us to accept Marchionini's model's simplicity and comprehensiveness in that it is divided into eight phases: recognise and accept an information problem, delineate and comprehend the problem, select a search system, frame a query, conduct a search, scrutinise results, source information, and reflect/iterate/stop. Also, rather of simply recognising the importance of 'use or system' itself, as some classic techniques in information behaviour studies did in the late 1970s and early 1980s, it allows us to consider a strong relationship that exists between a 'user' and 'use. Marchionini's model is useful to students because it emphasises information needs, information users, and how they look for information, what they do with it, and what they do when they fail to obtain the desired information at any stage and must refresh their information-seeking or searching process (Berget, MacFarlane & Pharo, 2020).

As a result, students' information needs and information-seeking behaviour invariably entail a variety of persons and media from which information can be obtained during the information-seeking process.

3.5 Rationalisations for theoretical framework employed in the study

An exploration through the literature thus far has revealed various aspects of the discussed models that were important in view of this study. Aspects that are important in the models used include the different ways people scan their environments for relevant information, browsing techniques that are generally used and how people seek information from a variety of sources. Based on the

rationalisations in the previous section, Marchionini's model of information-seeking is chosen to serve as the theoretical framework in this study.

Marchionini's model was chosen because it centres mainly on the electronic environment; a main emphasis of this study which partly concentrates on information behaviour in an environment. A guiding question for the study remains as how efficient ICT resources to students at UCC in terms of the promotion of sound are learning and research work. The choice of a suitable research model to give the study's context was the first theoretical topic that needed to be addressed. In the preceding session, a scholarly literature study on theoretical models of information-seeking behaviour was provided. A variety of study models of information demands and seeking behaviour of various categories of users were also examined. The same elements are not tested in all information-seeking behaviour models. Wilson (1999:55) and Lillard and Ha (2018) argue that researchers should first learn what each model is intended to evaluate, then choose a model based on whether it will offer the information required. Wilson goes on to say that this must be done exactly, consistently, and methodically, and that it must be able to explicate or foresee the expected events, allowing for precise verification of exemplifications and discoveries.

The general model of information-seeking (Broder, 2002) was chosen to serve as the study's theoretical framework. The framework has the elements that could help to address the principal research question; it incorporates both information needs and information-seeking which are the core aspects of the current study. It would also enable the researcher to study the education students as information users or seekers within the context of their studies and other various factors that influence their information needs and seeking behaviour. Sutcliffe's and Ennis's (1998) standard model of the search process as adopted in the work of Broder (2002) depicts a cycle consisting of four main stages, i.e., problem identification, articulation of information need(s), query formulation and results evaluation (Lewis, 2017). This explanation is deemed ideal for the study. The study assumes that students are faced with countless challenges of information search and therefore, the first important step in the search process has to do with recognising the problem at hand (Lu & Hsiao, 2017). This would be followed by investigation into how these students express their information needs. Following this stage would be an investigation of how these students inquire for the information and then assessment of information obtained.

More so, Sutcliffe and Ennis (1998) linked diverse types of search schemes with each of these activities (e.g., scanning titles is associated with results evaluation). Their ideal also describes the

role of the searcher's knowledge. For instance, a guiding question for this study has to do with the kind of information that is needed by the undergraduate students at UCC.

Again, Sutcliffe's and Ennis's (1998) model accounts for the system and the information collections utilised. This provides support for the researcher to be able to investigate information resources that are utilised by the undergraduate students of UCC. The model also accounts for searching in general which is in line with the aim of the study which is to explore the information-seeking needs and behaviour of students with respect to their exploitation of ICT laboratory and library facilities with the intention of making recommendations to promote sound learning and research.

3.6 Conceptual framework

According to Kadir, Johari and Hussin (2018), the demands of students of the reading materials and library sources such as physical collection and online database are essential and quite needed to be provided by the library authorities. Moreover, with the recent improvement in technology, most university students can get access to information on and off-campus. However, most users especially students find themselves wanting when they are faced with the decision to access the right information which can serve their needs. Based on the literature reviews that have been done and the research questions as well as hypothesis guiding the study a conceptual framework for the study was developed.

Information in figure 3.8 depicts the conceptual framework used for this study. Two hypothetical models were constructed, and the first was to find out the impact of usage of ICT resources, usage of library resources, ICT software and ICT support services on the computer skills of students. The proposed model is shown in Figure 3.8.

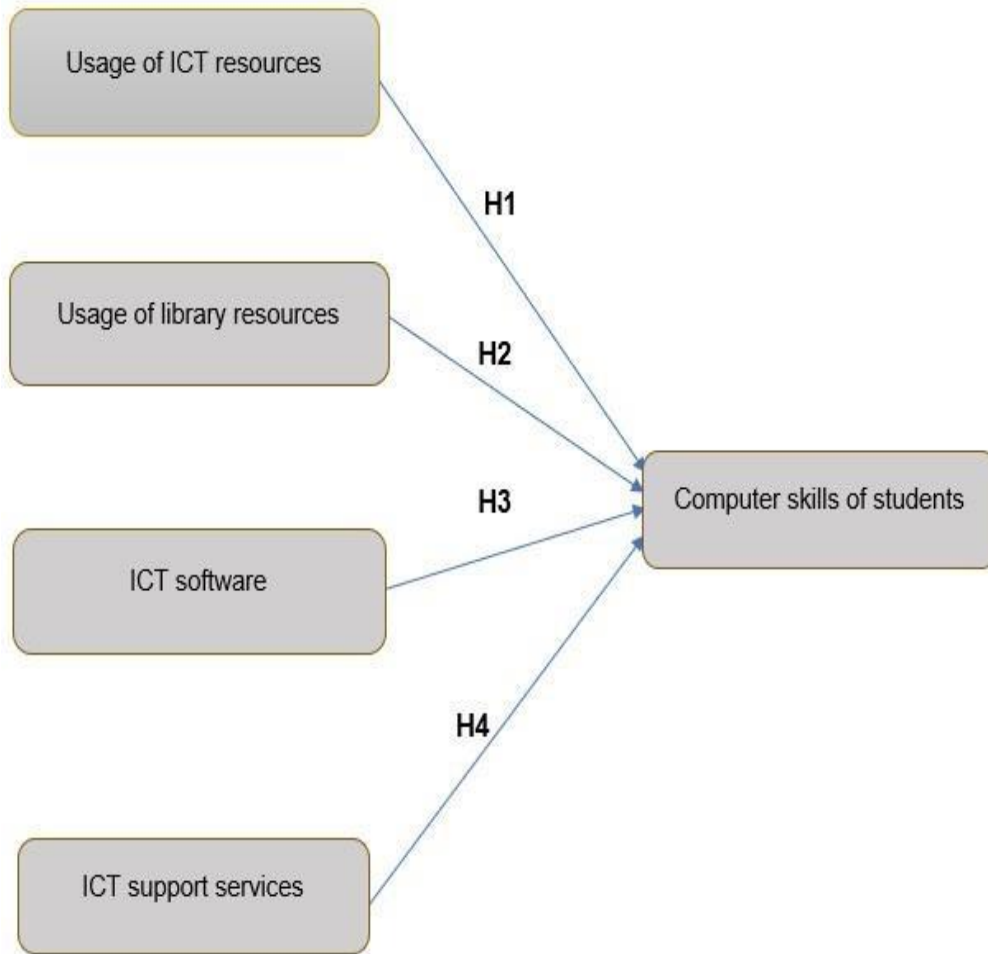


Figure 3.8: The study conceptual model predicting computer skills of students

The second model is to find the impact of usage of ICT resources, usage of library resources, ICT software and ICT support services, computer skills of students on information-seeking behaviour of students. The proposed model is shown in Figure 3.9.

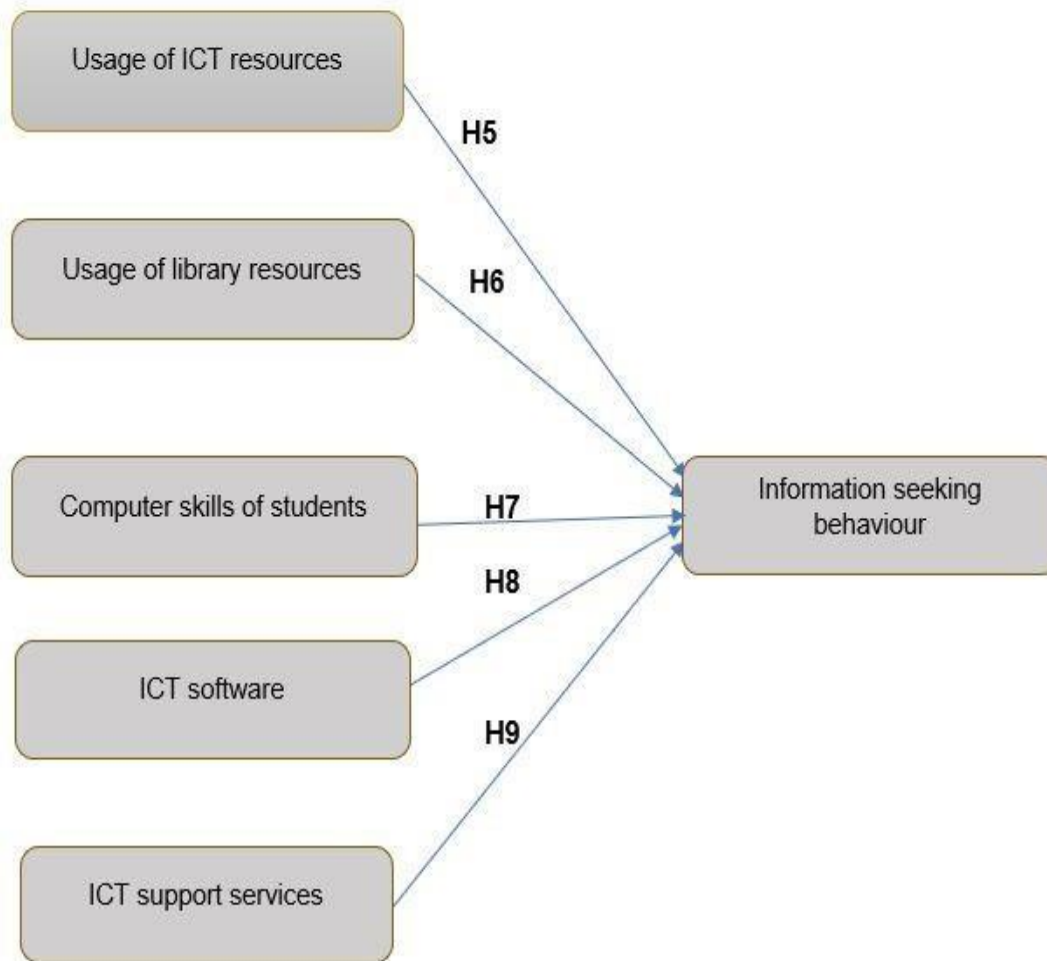


Figure 3.9: The study conceptual model predicting information-seeking behaviour of students (2021)

Figure 3.8 and Figure 3.9 indicates the need of students pertaining to their computer skills and information-seeking behaviour. The two models (Figure 3.8 and Figure 3.9) were not merged because the researcher wanted to find out whether the determinants governing computer skills of students were the same as that governing information-seeking behaviour.

3.7 Conclusion

This chapter discussed different information-seeking and information behaviour that are significant to a study on information needs and information-seeking behaviour of university students. It is obvious from the aforementioned views that each model showcases a unique but related approach to information-seeking behaviour study. The shared or collective factors that are found in all the models are that the usage of information is a process that involves several phases. Hence, these multiple phases comprise the identification of information needs, the choice to use

information, sorting out and obtaining information sources, discovering and assembling, expounding and processing the acquired information and putting the information into action. The end result of the information-seeking process is the final use of the specific information to complete an assignment which will then satisfy the initial need for information.

The information-seeking trend of information users was characterised by Ellis' (1989) model and Kuhlthau's (1993) information process model. These descriptions of the various information-seeking processes, like the monitoring and browsing, can help in the comprehension of the way students search for information. Dervin's (1983) sense-making approach stresses the need for information by users that occurs within the personal situation context. This draws the attention of the information-seeking processes illustrated by other models such as those from Ellis and Kuhlthau to the user, and the personal situation context by the user. This model calls to attention the gap that exists between a problem that is linked to an information that might constitute an information need and the information source that can offer the solution to the problem. Wilson (1999:253) clarifies that the strength of Dervin's model can be found partially in its procedural consequences, as, in terms of information behaviour, the model can lead to a system of questioning. Furthermore, Wilson (1999:253) explains that this can show the nature of a challenging situation, the degree to which information assists to close the gap of uncertainty or vagueness and the nature of the consequences from the use of information.

Ingwersen's (1992) approach targets to widely cover information access from assignment to retrieval and information use, it is logical and clear concerning participants and the cognitive structures with them, and targets at generality as opposite to special cases. The several models of information behaviour, information-seeking behaviour and information searching signify different features of the general problem; they correspond rather than contend. A key question remains as to how awareness of modes of information-seeking behaviour aids our comprehension of the search process in the case of information search behaviour. A view of information searching as a complex process embedded in the broader perspective of information-seeking behaviour and information behaviour in general could be focused on to attain best answers to the questions raised. One common element in all the information behaviour models is that a knowledge gap leads to an information need and has information-seeking behaviour as a result to enable the student to complete his or her tasks (assignments, term papers, projects etc.) and move on.

Marchionini's (1995) model suggests a comparable model of information-seeking process that marks out eight stages. Contrasting other models, Marchionini's (1995) information-seeking process tells of a process rather than self-determining behaviours of information consumers. Marchionini's model was found to be appropriate as a framework for this research work because he recognises numerous factors that can affect an information-seeking situation. These factors comprise the individual seeking for information, task or job, search system, area, background and results. Marchionini's model relates to an electronic environment and clearly shows the link between information behaviour and information-seeking with information needs in an e-learning environment. Chapter Four presents the research methodology used in this study.

Chapter Four

Research methodology

4.1 Introduction

Chapter one presented the orientation into the study. Among sections featured were the introduction and background to the study, the rationale for the study, overview of scholarly literature review on the problem and statement of the problem, the aim and objectives of the study, the significance of the study and a brief overview of the research methodology. In Chapter Two, a scholarly literature review on the concept of information and information-seeking-behaviour was provided. It discussed issues related to the role of the ICT and library in information dissemination and ways of improving information-seeking strategies. It also provided the theoretical framework of the study. Empirical studies on the information-seeking and needs of students and similar concepts were also discussed plus a brief background on ICTs in education in Ghana. Chapter Three motivated and discussed the theoretical framework which served as a lens for the study. The chapter also presented a broad exploration of theoretical models of information-seeking. The current chapter discusses in-depth the research methodology. The philosophical perspective(s) in which the study is situated are discussed at length. The chapter also provides justification for the methods of data collection employed for each research area in which data were collected.

4.2 The philosophical perspective(s) of the study

The study at hand exemplifies the pragmatist approach. The pragmatist embraces a pluralist position in a study (Katz & Light, 2013). This approach accepts that it is flawlessly conceivable to work with both the positivist reasoning and the interpretivist logic (Marino & Schembari, 2021). Kaushik and Walsh (2019) point out that, pragmatism is engaging, generally because it prevents the research engaging in pointless arguments concerning truth and reality; this is because this approach evaluates theories and beliefs in terms practical success of the approach. Pragmatist approach believes that it is highly possible to use both positivist philosophy and the interpretive philosophy (Doyle, Brady & Byrne, 2009). The positivist theoretical perspective which holds the view that social phenomena “such as human social behaviour and how societies are structured” ought to be studied using only the methods of the natural sciences (House, 2017:528).

According to Gray (2008), from the 1930s through the 1960s, positivism was the dominant epistemological paradigm in social sciences, with its central premise being that the social reality exists outside of the researcher's control and that its features can be assessed directly by observation. In a nutshell, positivism contends that:

- the natural and human sciences share common logical and methodological principles, dealing with facts rather than values;
- inquiry should be based on scientific observation (as opposed to philosophical speculation), and thus on empirical inquiry; and
- the natural and human sciences share common logical and methodological principles, dealing with facts rather than values.

Park, Konge and Artino (2020:691) assert that, ideas have the potential to become knowledge through utilising empirical testing as a means to ascertain to what extent these ideas could hold true. According to the author, positivists saw the natural sciences as progressing through the patient accumulation of facts about the world in order to produce generalisations known as scientific laws. Park et al (2020) further explain that positivism is a view about the appropriate methodology of social science that emphasises empirical observation and knowledge gained through literature where researchers are limited to data collection and interpretation in a more objective manner.

On the other hand, interpretivism focuses on understanding of the ways through which people experience the social world thus how researchers view and interpret elements of a study and integrating human interest into a study (Chowdhury, 2014). Accordingly, “interpretive researchers assume that access to reality (given or socially constructed) is only through social constructions such as language, consciousness, shared meanings, and instruments” (Babones, 2016) The development of interpretivist philosophy is based on the critique of positivism in social sciences. Accordingly, this philosophy emphasises qualitative analysis over quantitative analysis.

Interpretivism is used to combine together several theories, such as social constructivism, phenomenology, and hermeneutics, that reject the objectivist concept that meaning exists in the world irrespective of consciousness. (Ercan, Hendriks & Boswell, 2017). It is therefore important for the researcher as a social actor to appreciate differences between people (Yanow, 2017). Moreover, interpretivism studies usually focus on meaning and may employ multiple methods to reflect different aspects of the issue.

The rudiments of the study at hand identify partly with rationalisations on both philosophical positions above. For instance, in line with positivism, the questionnaires were used for data collection from students with the aim of reaching out to majority of the stakeholders (students) with respect to their information search behaviour. On the other hand, collecting data through interviews with other stakeholders (librarians) or participants of the study identifies more with a qualitative approach; a major feature of interpretivism.

Therefore, the study at hand, also case study research, adopted a mixed methods approach. This type of study is referred to by Molina-Azorin and Font (2016:549) as the “third methodological movement”. It can be seen as a new methodology originating around the late 1980s and early 1990s based on the work from individual scholars in diverse fields such as evaluation, education, management, sociology, and health sciences (Molina-Azorin & Cameron, 2010). Correspondingly, the current study sought to acquire an in-depth understanding as well as help address problems in the educational field related to the information needs of students and their information-seeking behaviours. Mixed methods research (McKim, 2017). Several texts outline these developmental phases (Timans, Wouters & Heilbron, 2019; Creswell & Clark, 2017; Molina-Azorin & Fetters, 2016).

Moreover, mixed methods research may contain a theoretical framework within which both quantitative and qualitative data are collected (Molina-Azorin & Cameron, 2010). The present study was rather framed in the Standard Model of the Search Process deductively alongside the social science framework structure (Creswell & Plano Clark, 2017). Typified by the current study, both qualitative and quantitative data on information needs and seeking behaviour of students were accessed and explored. To this effect, then, theories can be used in quantitative, qualitative and mixed methods studies. Theory use in mixed methods studies may include using theory deductively, in quantitative theory testing and validity, or in using it inductively as in an emerging qualitative theory or pattern. In addition, there are several unique ways that a theory is incorporated into a mixed methods study in which researchers collect, analyse and integrate both quantitative and qualitative data using diverse mixed methods designs (Creswell & Plano Clark, 2017).

The Standard Model of the Search Process is a conceptual model that explains what the researcher was looking for in a study. The model was described in terms of how it informed the quantitative and qualitative components of the investigation, as well as how it explained the significant correlations between variables in the study. Studies that have employed this paradigm have been

discussed, particularly those that are relevant to the study's theme. The model that indicates the direction of the problem causal links in the theory and the major concepts or variables in the theory was presented in the study. The model was revisited at the end of the study to review how it informed the findings and the results and compared with the use of the theory in other studies. Later on, in this chapter, it is shown at 4.3.4 (design of research instrument section) how the concepts encapsulated in the model informed the design of data collection instruments.

4.3 Methods of data collection

4.3.1 Research design

According to Dannels (2018) research design is a strategic framework which serves as a bridge between research questions and the execution of the research. It provides the framework that specifies the type of information to be collected, its sources and collection procedure (Sileyew, 2019). The research methodology includes a literature study and an empirical investigation. This study adopted an explanatory mixed method design for the purpose of acquiring an in-depth understanding of education students' information needs and seeking behaviour. As Creswell et al. (2017) state, a mixed method is more than simply collecting and analysing data from a qualitative and quantitative approach; it also incorporates a combined qualitative and quantitative approach. An implied assumption here is that the total strength should be more beneficial than using qualitative or quantitative research individually. Creswell et al. (2017), again stated that one purpose of employing a mixed method is to increase the probability to accomplish findings that are more dependable and pertinent than using the methods disjointedly.

Cronholm and Hjalmarsson (2011) note that the implementation of research methodologies in a parallel or sequential manner is a significant design component in mixed method research. Explanatory mixed method research is defined as a study in which the phases of the research are carried out in a sequential order, with one phase developing from or following the other. The research topics and methodologies utilised in one phase are influenced by the preceding phase. In parallel mixed method research the research includes phases that occur either simultaneously or with some time lapse. These phases address related parts of the same research questions. The research at hand employed the explanatory mixed method with phases that occur with one preceding the other. In this regard, a quantitative-qualitative (i.e., sequential-explanatory design) was considered; a two-phase design where the quantitative data are collected first, followed by qualitative data collection. The purpose is to use the qualitative results to further explain and

interpret the findings from the quantitative phase. For instance, a survey may be used to collect quantitative data from a larger group. Members of that group may then later be selected for interviews where they can explain and offer insights into their survey answers (Merriam & Grenier, 2019; Creswell and Clark 2011).

The explanatory design was chosen for this study because it best connects to the study's goal of gaining a better understanding of students' information needs and seeking behaviour at UCC, as well as how these needs are being handled by UCC library management. Hence, this design enhanced the understanding of the case of UCC as alluded above. A case study is referred to as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between the phenomenon and context are not clearly evident and in which multiple sources of evidence are used (Hardwick, 2016). Hancock and Algozzine (2017:6) state that 'the key aim of a case study is to provide an all-inclusive explanation of the case and in-depth knowledge of the exact case through rich descriptions positioned in context.

Prior to the formulation of the definition by the above-mentioned authors, Fidel (1984:273) stated that 'case studies have been used in library and information science to differentiate broad patterns of behaviour'. Case study research has also been successfully used to investigate perceptions of indecision, complication, construction and sources in the information search process of a premature career information worker (Kuhlthau, 1993). Brannen, (2017) mentions that "depending on theories, hypothesis and research questions, both qualitative and quantitative methods can be used in the same research project". For instance, with the current study an investigation into why and how students use ICT in their studies only depended on their responses to questionnaire items but also on responses obtained from interviews and how these relate to literature.

Questionnaires and interview guides were used as major information collection tools for the study. This was pre-tested prior to being used to solicit primary information from the participants (students) considered for the main study. The questionnaires were used to collect data to answer the research questions. According to Queirós, Faria and Almeida (2017), the use of such inductive qualitative methods facilitates the gathering of 'deep' information and perceptions. Secondary data gathering techniques such as reviewing literature was employed, to help the researcher obtain in-depth information on the topic under study.

In order to ensure that the study appropriately reflects a case study as explained earlier, the advantages, benefits and properties of case studies were summarised in table 4.1 and linked to this study.

Table 4.1: Advantages and characteristics of case studies applied to this study

Advantages and properties of case studies	Applicability to this study
Merriam, and Grenier (2019) emphasises that data are obtained from experiences and practices of people. Therefore, a strong mirror image of truth	Data were collected from the students on their involvements and strategies concerning their research for information. Librarians were also contacted for information on their experiences in supporting students.
Case studies aid in answering better research question(s) that are more explanatory (Timans, Wouters & Heilbron, 2019)	This study is purposed to form a broader understanding of the information needs, behaviour and use by students at UCC, as well as to investigate how these needs are presently being solved by the Management of UCC. Hence, a mixed methods case study was employed, thus uniting both qualitative and quantitative research approaches and procedures.
A case study approach permits the researcher to include a large number of elements and associations (Fidel, 1984)	A goal of this study was to investigate not only the information-seeking behaviour and information use of students in detail, but to also find out available strategies provided by the library to enhance the search for data and the relationship between information needs and information services was also another focus of the study

Advantages and properties of case studies	Applicability to this study
A case study method permits the researcher to use several sources of proofs (Brannen, (2017).	Literature review of this study indicates data on the information needs of students can be obtained from multiple sources. Aided by a case study approach, this study used the proposed sources inclusive of documents, archival records, interviews and questionnaire administration.
Research that demands ample understanding of the observed phenomenon is best worked out with case studies approaches (Connaway & Powell, 2010; Brannen, 2017).	The aim of this study was to get a thorough understanding of the information needs, seeking behaviour and use of students employing the methods discussed in this chapter.
Case studies makes it possible to focus on and examined single entities thoroughly (Connaway & Powell, 2010; Case, 2012; Leedy & Ormrod, 2015).	This study focused exhaustively on the information needs of a relatively small group of students (undergraduate regular education students). Another focus was on the services offered by the small group of information experts servicing them.
With case studies, the concentration is on the occurrence in environment or background (Case, 2012).	Information-seeking behaviour of students at UCC was investigated in the context of their academic environment.

4.3.2 Description of the context of study (UCC)

UCC is located in the city of Cape Coast and was established in 1962 to satisfy a huge need for skilled and qualified educational manpower. It is one of the over sixty universities and colleges in Ghana. The aim was to train and develop graduate teachers so they could impart knowledge in second tier teacher training colleges. The university has since grown to accommodate the training of doctors, agrarians, administrators and education planners (<https://ucc.edu.gh/main/about/history>).

4.3.2.1 Student profile

UCC has five colleges. The colleges have different faculties, schools and departments. College of Education is one of these five colleges. Three faculties and a school can be found under the College of Education. The number of undergraduate regular students enrolled in the college as at 2017/2018 academic year numbered up to 5,644 (SRMIS, 2018). The breakdown of the number of students is shown in Table 4.2.

Table 4.2: UCC Undergraduate Regular Education Students Statistics for 2017/2018 academic year

Level	Males	Females	Total
100	702	559	1,261
200	674	489	1,163
300	929	538	1,467
400	1,103	650	1,753
Total	3,408	2236	5,644

Source: SRMIS, (2017)

4.3.2.2 Library services at UCC

The major obligation of the University Library which is regarded as the pivot around which the academic and research activities of the University revolve is to provide information resources, learning facilities and services to support the core business of the University namely, teaching, learning, research and public service (Kwafoa & Imoro, 2020). The specific services provided by UCC library System are as follows (Library Handbook of the University of Cape Coast, 2020):

- access to scholarly information resources for academic work;
- collections management;
- book/material lending;
- reference and information services;
- questions and answers service;
- selective dissemination of information;
- current awareness service;
- information literacy instructions;
- learning and research support;
- electronic support (computers, photocopying, Internet, scanning, printing, etc.);

- advisory services on scholarly communication, intellectual property, open access, institutional repository, etc;
- library orientation/education;
- bindery service;
- digitization service; and
- special services for the physically challenged.

4.3.2.3 Library facilities at UCC

The library facilities available at UCC are as follows:

- Learning space for 2000 readers;
- Carrels for Graduate students;
- Photocopying/Printing/Scanning/Digitizing;
- Training Room (Intelligence Centre);
- Conference room;
- WiFi;
- Computer workstations;
- Resource Centre for Alternate Media and Assistive Technology (R CAMAT);
- Electronic Information Resources(E-books/E-journals);
- Research Support/Tools; and
- Senior Members Commons; Collections of books/materials; and University Gallery.

4.3.3 Population and sampling

A sample is a group of people from whom data is collected, whereas sampling is the process of selecting representative participants from a broader group of people (population) (Etikan & Bala, 2017). The target population for the study was all the undergraduate regular education students of UCC for the 2017/2018 academic year, totalling 5,644 students. In addition, librarians of libraries of the various colleges were also considered part of the target group to enable acquisition of additional information. This group of participants was selected through a purposive sampling technique. The technique was preferred to others because of a number of reasons.

Firstly, the information collected in purposive sampling has a low margin of error other than a random survey where the margin of error on their conclusions can be significant (Etikan, Musa & Alkassim, 2016). Most random surveys offer a margin of error that is between 3% to 6% and

sometimes even higher (<https://connectusfund.org>). Purposive sampling involves selecting people based on recognizable features that place them in the same demographic context. The inference is that the data is acquired directly from the proper source, with a very small and tiny margin of error ((Etikan et al., 2016).) For instance, librarians of the various colleges were considered part of the target population because they are the custodians of information resources of UCC available for students' use. Since they provide services related to information use to students, the researcher thought it wise to involve them in the study in order to acquire additional information on students' information needs and seeking behaviours as well as information on past and current state of information resources of UCC available for students' use.

Secondly, purposive sampling technique can glean information from the various extremes of population groups. In other words, it helps researchers to identify the extreme viewpoints that are present in each population group as well. For instance, in this study, different librarians from the different colleges of UCC were considered instead of limiting considering only librarians at College of Education in order to solicit widen the scope of perspectives. This advantage makes it probable to have a better understanding about possible difference(s) in behaviour patterns between regular education students and other students in other colleges from the perspectives of the librarians.

Thirdly, flexibility of purposive sampling technique permits researchers to save time and money during data collection (Romero, Kwan & Suchman, 2019). In line with the selection of librarians to partake in the study, the researcher thought it wise to manage time by selecting only a representative section of the librarians.

Fourthly, the purposive sampling techniques enable research to justify generalisations they make per their sample. These efforts must be reasonable, investigative or theoretical in nature to be valid. The study analysed information obtained systematically per literature in order to ensure that appropriate generalisations are made.

Fifthly, purposive sampling can produce results that are available in present. Researchers' employment of surveys or polls for collecting data from a specific population sample assures usefulness information they acquire is useful in real-time situations (Etikan, Sulaiman & Alkassim, 2016). Members of the sample group (in this case librarians of different colleges) all possess an applicable level of understanding and knowledge about the subject being evaluated (information

needs and seeking behavior for this study), which means there is less interruption involved. One does not need to process the data to glean results as it is likely to ask directed questions that produce the precise answers that one need in each case. For instance, a targeted question such as “In what ways can the strategies for satisfying information needs and seeking behaviour of the undergraduate students at UCC be improved to promote sound learning and research work?” the question, addressed to each librarian, could provide fairly trustworthy responses.

However, there exist a significant number of weaknesses on purposive sampling. This broadly has to do with the process being prone to researcher biases, manipulation of data and production of inaccurate assumptions. Purposive sampling is highly disposed to researcher bias irrespective of the type of method is being employed to collect data (Sharma, 2017). In that, the researcher’s viewpoints can influence the data they collect in numerous ways since he/ she oversees the selection process, e.g., though there may be a conscious effort by researchers to set aside bias, some may instinctively manipulate the data that are available to create the outcomes that support their predetermined notions.

In purposive sampling, the participants can also manipulate the data being collected (Sharma, 2017). For instance, an individual’s knowledge of his or her selection as a participant for a research project could initiate a change in his or her behaviour. For instance, the students and librarians might choose to act in a manner that allowed the researcher to reach the inferences that they anticipate, or vice versa. Furthermore, some of the participants of this study may choose to lie to create an undesirable result as they have personal biases that they want to take public. This implies that there are times when the result being studied could be more erratic than predicted. According to Mohajan (2017:59), “it takes only the skill of the researchers to determine the validity of data collected”. Accordingly, in this study, the researcher checked for the validity of data collected by checking for consistency in responses obtained from each librarian interviewed.

Purposive sampling can still produce inaccurate assumptions (Gentles, Cathy & Ploeg, 2015). Researchers’ viewpoints can influence the data they collect in numerous ways since they oversee the selection process (Surmiak, 2018). Even in a situation where conscious effort is made to avoid a bias, some may unintentionally manipulate the data that is available to create results that back their predetermined ideas. One librarian was selected from each of the five colleges in UCC to obtain a pool of participants numbering five. The gender distribution of the interviewees were three (3) males and two (2) females.

On the other hand, a quota sampling technique was employed to select the education students from all fourteen departments in the college for the quantitative part, where quota sampling refers to a method of gathering representative data from a group (Berndt, 2020). As opposed to random sampling, quota sampling requires that representative individuals be chosen out of a specific subgroup. The type of quota sampling employed was non-proportionate quota sampling where a minimum percentage is set for participants to be chosen from all subgroups from which sample would be drawn. In this study, a minimum percentage of 7.1% was set for all the fourteen departments in the college. This was to ensure that students views are evenly represented. The sample size of 361 from a target population of 6000 is considered based on Morgan’s and Krejcie’s sample size determination procedure as described by Moon, Callahan and Tomlinson (2003). The Krejcie and Morgan's sample size determination table is shown in table 4.3.

Table 4.3: Krejcie’s and Morgan's sample size determination table

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
N	S	N	S	N	S
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354

N	S	N	S	N	S
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

N=Population S=Sample

In Table 4.3, each population value stated corresponds with its sample size that needs to be considered. Therefore, the population for the study is all the undergraduate regular education students at UCC for the 2017/2018 academic year, totalling 5644 falls within the N values of 5000 and 6000 but closely related by value in respect of approximation to the latter N than former N. Therefore, the sample size 361 of N= 6000 was considered for the student participants.

According to Krejcie and Morgan (1970), the ever-increasing need for a representative statistical sample in empirical research which created the demand for an effective method of determining sample size led their quest of addressing the existing gap in sample determination. This reason, according to the researchers, motivated them to come up with a table for determining sample size for a given population for easy reference (Krejcie & Morgan, 1970).

4.3.4 Design of research instrument

The research instruments used in this study were both structured questionnaire and open-ended semi structured interview guide. These two were adopted because of the mixed method approach used in the study. Further explanation of how the various instruments were specifically used in the study are explained in the subsequent section.

4.3.4.1 Survey questionnaire

4.3.4.1.1 Design of the questionnaire

i) Theoretical aspects considered in the design of the questionnaires

Table 4.4 presents theoretical aspects considered in the designing of the questionnaires. It also illustrates which items correlates with a particular model considered for the study with the primary model being General Model of Information-Seeking by Broder (2002). The first column of Table 4.4 shows the type of model and the article in which the model can be found. The second column shows the particular questions on the questionnaire.

Table 4.4: Standard Models of Information-seeking considered in the design of the questionnaire

Type of Standard Model of the Search Process	Items in the questionnaire
General Model of Information-Seeking (Broder, 2002)	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 to 34
General Model of Information-Seeking (Broder, 2002) Information-Seeking model (Marchionini, 1995)	7, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 25, 28, 31, 32, 34
Reference is made to Table 4.3 and Table 4.3 as presented in General Model of Information-Seeking (Broder, 2002) Standard model of the search process Sutcliffe and Ennis (1998)	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15-34

ii) Structure of the questionnaire

The purpose with the questionnaire was to obtain quantitative data. In that regard, fixed responses or structured questions were used (Refer to Appendix 8). Inclusive of questions were biographical questions with the aim of collecting data on respondents' background information regarding academic level and gender of students. Other biographical questions were self-perception questions such as kinds of information and types of information resources needed and utilised by the undergraduate students of UCC (for example, the question on the prominent type of information students seek regarding their course of study. Also, the question on students' chief sources of academic information in the university). Other inquiries based on the opinions of the students include tactics used by them and undergraduate education students looking for

informational resources in the university. Another question has to do with how often in day students normally make use of ICT resources for searching information; the efficiency of UCC’s ICT resources, including the library, to students with respect to promoting sound learning and research work (for example, how accessible ICT resources in UCC IT laboratory are. Also, how adequate are study materials in UCC library for effective studies or research). Finally, the undergraduate students' proposals for techniques and strategies for meeting information demands and seeking behaviour should be improved to encourage excellent learning and research work at UCC. A question on how students estimate the quality of their relationship with UCC IT laboratory workers would be posed once more.

Questions in the following formats were used: Checklist for background information and Likert scale questions for the other items. A question or a statement on a Likert scale has five or seven alternatives. A Likert scale is made up of different ranges, such as a five, seven, nine, ten, and so on, for each statement or question. The choices range from Strongly Agree to Strongly Disagree so the survey maker can get a holistic view of people’s opinions. All Likert scales also include a mid-point, for those who are neutral on the subject matter (Byrne, Weston & Cave, 2020). For this study, a Likert scale of five options namely Strongly Agree – SA, Agree – A, Undecided or neutral – U, Disagree – D, Strongly Disagree – SD was used.

Table 4.5 presents the items in the questionnaire and illustrates which ones answer which research questions stated in Chapter 1 of the study. The full details of the questionnaire can be found in the Appendix of the paper.

Table 4.5: Items in the quantitative instrument (questionnaire) matched to the research questions

Research question (in chapter 1)	Items (Questionnaire)
Research Question 1: What kind of information is needed by the undergraduate students at UCC?	3
Research Question 2: What types of information resources are utilised by the undergraduate students of UCC?	4, 5
Research Question 3: What strategies do the undergraduate education students employ in seeking information resources in the university?	6, 7, 8, 9, 10, 11, 12, 13, 14

Research question (in chapter 1)	Items (Questionnaire)
Research Question 4: How efficient are UCC's ICT resources, including the library, to students with respect to promoting sound learning and research work?	15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33.
Research Question 5: In what ways can the strategies for satisfying information needs and seeking behaviour of the undergraduate students at UCC be improved to promote sound learning and research work?	34

4.3.4.1.2 Piloting of questionnaire

The questionnaire was given to 100 students from three departments at the University of Education, Winneba (UEW) in the same geographical location, Ghana's central region, and with similar institutional characteristics on a pilot scale. UEW was established in September 1992 as a University College under PNDC Law 322. On the 14th of May 2004, the University of Education Act, Act 672 was enacted to upgrade the status of the University College of Education of Winneba to the status of a full University. Prior to its charter, UEW was affiliated to UCC and therefore inevitably mimicked UCC in terms of organizational philosophy, aims and structures. Like UCC, UEW's core mandate centres around producing professionals to beef up the educational sector. It therefore implies that there exist enough similarities that justify UEW's consideration in the pilot phase of research instrument development. A 35 itemed questionnaire was scored on a Likert scale. Sheets of paper were added to the questionnaire for the respondents to pass comments on the clarity, weakness, inadequacies, ambiguities and problems in all aspects of the items in the instrument.

4.3.4.1.3 Adjustments made on the questionnaire because of the pilot

To establish content related evidence of validity, the draft questionnaire was given to the three experts in the field of Measurement and Evaluation for their review since content validity can be determined by the experts' judgment. Their suggestions were used to review the instrument and restructure its items. Saunders and Pincas (2004) define reliability as the extent to which data collection technique(s) can yield consistent findings, similar observations or conclusions reached by other researchers, or the extent to which there is transparency in how sense was made from the raw data. Some elements evaluated were then translated into test items after a detailed theoretical analysis of how students' information demands and seeking behaviour affect learning and research

activities. Since the items in the questionnaire were multiple scored on the Likert scale, the Cronbach's co-efficient alpha was most appropriate. The choice of the Cronbach's co-efficient alpha was made on the merit of Ary's, Quansah (2017) view that the Cronbach's alpha is used when measures have multiple-scored items such as attitudinal scales. For example, on a Likert scale, an individual may receive a score from 1 to 5 depending on which option was chosen or what response was obtained. Similarly, as part of the instructions in answering items in the questionnaire, the participating students were asked to give the appropriate responses that best reflect the extent to which the participating students agree or disagree with the statements with respect to the Key: SA – Strongly Agree A– Agree U–Undecided or neutral D – Disagree SD – Strongly Disagree Strongly Agree. Also, based on the comments obtained from the respondents during the piloting of questionnaires, statements in the piloted questionnaires that were judged to be ambiguous, or misleading were either removed from the questionnaire or revised for clarity before the actual data collection took place.

The Cronbach's co-efficient alpha for the instrument was recorded to ensure reliability of the instrument. George and Mallery (2018) define reliability as the extent to which data collection technique(s) can yield consistent findings, similar observations or conclusions reached by other researchers, or the extent to which there is transparency in how sense was made from the raw data.

The Cronbach's co-efficient alpha obtained for the questionnaire was 0.86 implying that the instrument had high internal consistency (Hair Jr., Risher, Sarstedt & Ringle, 2020). Following the piloting of the instrument, the questionnaire was revised into a 34 items.

4.3.4.2 Interviews

4.3.4.2.1 Interview types and methods

Interviews are key data collection techniques that involve the researcher and the subject communicating verbally (Fox, 2009). In exploratory research, interviews are frequently utilised in survey designs (Hallingberg, Turley, Segrott, Wight, Craig, Moore, Murphy, Robling, Simpson & Moore, 2018) and descriptive studies (Barrett, 2016).

The depth and freedom with which a participant can react will be influenced by the interview design and question phrasing. Some interviews are designed to generate long, detailed responses, while others are geared to elicit brief, focused ones (Fox, 2009).

Structured, semi-structured, and unstructured interviews are the three primary forms of interviews (Alaraj, 2016). The level of organisation placed on an interview is used to categorise it. Individual or group interviews (sometimes known as focus groups) are the most common tactics or methodologies used in interviews (Fox, 2009). Individual and group interviews can be utilised together (Fox, 2009). Individual interviews can sometimes inform a follow-up focus group, and vice versa. After one has determined whether to employ an individual or group strategy, one will need to choose an interviewing method (Fox, 2009). The three ways to conduct interviews are face-to-face interviews described by Zhang, Kuchinke, Woud, Velten and Margraf (2017) Telephone and video linkages, such as those in which the researcher and respondent meet in person for this form of interview (This can be used where a face-to-face interview is not possible and may be appropriate where the topic is not sensitive and non-verbal behaviour is less important) as well as online interviews (The internet provides opportunities through chat rooms for interviewing and is a growing method of conducting in-depth interviews) (Fox, 2009).

Table 4.6 presents a summary of the advantages and disadvantages of interviews by Beach and O'Brien (2017:104).

Table 4.6: A summary of the advantages and disadvantages of interviews

Advantages	Disadvantages
High return rate	Time-consuming
Fewer incomplete answers	Small scale study
Can involve reality	Never 100% anonymous
Controlled answering order	Potential for subconscious bias
Advantages	Disadvantages
Relatively flexible	Potential inconsistencies

A semi-structured interview was considered as the qualitative research tool for the study. This was chosen over the other two methods based on the need for collecting attitudinal information on a large scale such as the large students body the study dealt with. Kallio et al. (2016) mention that a major reason for the use of semi structured interviews had to do with the advantage posed by open-ended form of the questions which did not only aid to define the topic under investigation, but also gave room for the interviewer and interviewee to discuss some topics in more detail. For instance, interviewer: What suggestions would you give for improving strategies these strategies for

satisfying information needs and seeking behaviour and also promoting sound learning and research work of students? Interviewee: I think more training on IT applications for information-seeking should be implemented to help students improve their IT skills. Does it mean administration is not concern about students' level of IT skills? And so on.

Though the open-ended questions of this type of research tool posed the challenge of difficulty in establishing uniformity across respondents, this problem was curtailed by summarising information gathered according to particular themes while thoroughly going through the entire summaries several times to get the meaning of the information obtained. In addition, it was ensured that the interviewer refrained from influencing the respondents in any way and maintained a neutral manner. For example, a comment such as “I see you have a fairly good IT system in your institution” was avoided. The flexible nature of the process, where the interviewer has the freedom to use hints to encourage the interviewee to consider the question further (Husband, 2020:206), was also a good reason a reason for the adoption of the semi structured interview. For instance, “What do you think about the library system with respect to searching for resources?” could be followed up with “such as books”.

Also, the process allows for probing of the interviewee to elaborate on the original response by the interviewee. For example, Interviewer: What can you say about the strategies you employ in seeking information resources in the university? Are they effective at all? Interviewee: Somehow! Interviewer: Could you be more specific by rating the efficiency on a scale of 1 to 5?

Semi-structured interviews are much more time-consuming than structured interviews due to time involved with drawing up of coding frames and the carrying out of content analysis. However, the significant few number of participants (interviewees) aided to reduce completion time of these actions.

The interview method or approach chosen, based on the rationalisations above, was individual semi-structured interviews. This choice comes with the reasons that it enables researchers to obtain detailed information about the meaning of a situation or social context to each participant in a setting (Husband, 2020:206). As a result, the situation at hand in this study is students' information needs and searching at UCC. Additionally, the strategy was chosen optimal when the researcher was interested in learning about the many perspectives that would be sought from individual students and librarians from various UCC institutions. They were appropriate in situations where

a range of distinct stories about a site or context were expected, and where there was a desire to learn about this variety of stories.

The method was narrowed down to follow the process of face-to-face interview which encourages a conducive and tension free atmosphere for the interview process (Oltmann, 2016). For instance, where a respondent may be unwilling to speak about some aspect of their experience (e.g., follow up question on interviewees computer knowledge or skills with regard to the study at hand) in front of others during a group interview, this can easily be achieved in a face-to-face interview. Also, with the face-to-face interview, interaction between interviewee and interviewer is very cordial and tension free compared to the other methods (telephone and video links and web interviews). This creates the atmosphere for a healthy conversation or an interview void of tension and biases to be conducted. In this instance, clarifications can be made from both sides of the dialogue. Notwithstanding, the skills of the interviewer also goes a long way to achieving this goal.

According to Kallio, Pietilä, Johnson and Kangasniemi (2016:2955), semi-structured interviews that are well-planned and conducted are the result of extensive preparation. The interview schedule, the interview itself, and the analysis of the interview data all necessitate considerable consideration and preparation.

4.3.4.3 Design of the interviews

i) Theoretical aspects considered in the design of the interviews

Table 4.7 presents theoretical aspects considered in the design of the interview guide for the representative for librarians in the colleges. It also illustrates which items correlates which the models considered for the study with the primary model being General Model of Information-Seeking by Broder (2002).

Table 4.7: Standard Models of the Search Process considered in the design of the interview guide for librarians

Type of Standard Model of the Search Process	Item(s) (Interview guide)
General Model of Information-Seeking (Broder, 2002)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
General Model of Information-Seeking (Broder, 2002) Information-Seeking model (Marchionini, 1995)	7, 8, 9, 10

General Model of Information-Seeking (Broder, 2002) Standard model of the search process Sutcliffe and Ennis (1998)	1, 2, 3, 4, 5, 6, 7, 9, 10
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Table 4.7 presents theoretical aspects considered in the design of the interview guide for the representative for selected students in the colleges. It also shows which elements correspond with which of the models evaluated for the study, with Broder's General Model of Information-Seeking as the dominant model (2002).

Table 4.8: Standard models of the search process considered in the design of the interview guide for students

Type of Standard Model of the Search Process	Item(s) (Interview guide)
General Model of Information-Seeking (Broder, 2002)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
General Model of Information-Seeking (Broder, 2002) Information-Seeking model (Marchionini, 1995)	8, 9, 10
General Model of Information-Seeking (Broder, 2002) Standard model of the search process Sutcliffe and Ennis (1998)	1, 2, 3, 4, 5, 6, 7, 9

4.3.4.4 Structure of the interview guides

The interview guide was designed with open-ended or unstructured questions to collect qualitative data. The items in the guide were framed around the following aspects: the types of information needed by undergraduate students at UCC; the types of information resources used by undergraduate students at UCC; the strategies used by undergraduate education students in seeking information resources in the university; the efficiency of UCC's ICT resources, including the library, to students in terms of promoting sound learning and research work; and the ways in which undergraduate education students strategise in seeking information resources in the university. (Refer to Appendices 9 and 10).

Table 4.9 presents the items in the interview guide for the representative for librarians in the colleges. It also illustrates which items answer which research questions stated in Chapter One of the study.

Table 4.9: Items in qualitative instrument (librarian interview guide) matched to the research questions

Research question (in Chapter 1)	Items in the interview guide
Research Question 1: What kind of information is needed by the undergraduate students at UCC?	1, 2
Research Question 2: What types of information resources are utilised by the undergraduate students of UCC?	1, 2
Research Question 3: What strategies do the undergraduate education students employ in seeking information resources in the university?	3
Research Question 4: How efficient are UCC's ICT resources, including the library, to students with respect to promoting sound learning and research work?	4, 5, 6, 7, 8, 9
Research Question 5: In what ways can the strategies for satisfying information needs and seeking behaviour of the undergraduate students at UCC be improved to promote sound learning and research work?	10

Table 4.10 presents the items in the interview guide for the representative students in the colleges. It also illustrates which items answer which research questions stated in Chapter 1 of the study.

Table 4.10: Items in qualitative instrument (student interview guide) matched to the research questions

Research question (in Chapter 1)	Items in the interview guide
Research Question 1: What kind of information is needed by the undergraduate students at UCC?	1, 2
Research Question 2: What types of information resources are utilised by the undergraduate students of UCC?	1, 2
Research Question 3: What strategies do the undergraduate education students employ in seeking information resources in the university?	3

Research question (in Chapter 1)	Items in the interview guide
Research Question 4: How efficient are UCC's ICT resources, including the library, to students with respect to promoting sound learning and research work?	4, 5, 6, 7, 8
Research Question 5: In what ways can the strategies for satisfying information needs and seeking behaviour of the undergraduate students at UCC be improved to promote sound learning and research work?	9

c) Validity of interview guide

Validity is the degree to which an instrument measures what it is intended to measure and accurately (Mohajan, 2017). Validity of the 15 itemed interview guides was determined by expert judgement. In this study, experts in the field of information studies and research studies were approached to evaluate the validity of the interview guide. Three PhD holders who worked in the university library, as well as senior academics from the information studies and statistical departments at UCC, were provided the interview guide. High internal consistencies obtained for the interview guides implied that the items in the interview guide measured the particular concept or construct it is purposed to.

d) Adjustments made in the interview guide because of the justification process

In collaboration with experts in the field of information studies and research studies, the items judged to be ambiguous, or misleading were either removed from the interview guide or revised for clarity before the actual data collection took place. The validation process led to the instrument being revised into a 10-itemed and 9-itemed one for librarians and students, respectively. For instance, the item, "What strategies are in place for satisfying information needs and seeking behaviour of the students to promote sound studies?" was omitted from the interview guide for students. This was done in light of the opinions of the experts consulted, who stated that if it is not the responsibility of students to apply the aforementioned tactics, they are clearly judged incapable of answering such a question. Also, in the case of the librarians, the question "How would you rate the universities librarian in terms of how he or she has performed over the past ten years?" was omitted as it sought to solicit provocative responses that might lead to the digression of the purpose of the study.

4.4 Data collection procedures

4.4.1 Quantitative data collection methods

These methods rely on random sampling and structured data collection instruments that fit diverse experiences into predetermined response categories. They produce results that are easy to summarise, compare and generalize (Gray, 2013). Typical quantitative data gathering strategies include experiments; observing and recording well-defined events; obtaining relevant data from management information systems and administering surveys with closed-ended questions. Two main types of questionnaires are useful in quantitative data collection. These are paper-pencil-questionnaires (Leedy & Ormrod, 2001:4) and Web-based questionnaires (Pariyo, Greenleaf, Gibson, Ali, Selig, Labrique et al., 2019:10).

With the help of 10 research assistants, the quantitative data for the study were collected using paper-pencil-questionnaires. On the day of the questionnaire administration, the participating students were given a briefing on the rationale for which the data are being collected. The items on the questionnaire were read and/or explained to participants where necessary and then given to the participants to answer. An observed average time of 20 minutes was taken by each participant to answer items in the questionnaire. The whole questionnaire administration exercise was done in a day and all the completed questionnaires was collected the same day.

Questionnaires often make use of checklist and rating scales. These tools help simplify and quantify people's behaviours and attitudes. A checklist is a list of behaviours, characteristics or other entities that the researcher is looking for. Either the researcher or survey participant simply checks whether each item on the list is observed, present or true or vice versa. A rating scale is more useful when a behaviour needs to be evaluated on a continuum. They are also known as Likert scales (Leedy & Ormrod, 2001). For this study, the administering surveys with closed-ended questions strategy was utilised. In the case of this study, respondents were asked to choose the appropriate responses that best reflect the extent to which they agree or disagree with statements or items on the questionnaire. This was a Likert scale of five options namely Strongly Agree – SA, Agree – A, Undecided or neutral – U, Disagree – D, Strongly Disagree – SD.

4.4.2 Qualitative data collection methods

Qualitative data collection methods are significant in impact evaluation because they provide information that can be used to better understand the processes that lead to observable results and

analyse changes in people's perceptions of their well-being (Costa, Vaz & Menezes, 2021). Data collection in a qualitative study takes a long period, regardless of the types of data included (Stieglitz, Mirbabaie, Ross & Neuberger, 2018:161). Qualitative data collection methods are significant in impact evaluation because they provide information that can be used to better understand the processes that lead to observable results and analyse changes in people's perceptions of their well-being.

Using field notes, sketches, audiotapes, photographs, and other appropriate methods, the researcher must document any potentially helpful data thoroughly, accurately, and systematically (Kabir, 2016). In this study, the researcher employed the digital-record interview technique, which involves recording participants prior to them giving their consent prior to interview. The qualitative methods most commonly used in evaluation can be classified in three broad categories namely in-depth interviews, observation methods (Atmowardoyo, 2018) and document review (Matyas, 2020; Adhabi & Anozie, 2017). However, the researcher employed in-depth interviews. In-depth interviews - Qualitative data were sought through the interviews with the librarians and a section of the students a couple of days after the administration of questionnaires. The face-to-face digital record interview technique was employed. The flexibility of this method ensures a cordial dialog which encourages the interviewee to respond freely to questions (Costa, Vaz & Menezes, 2021). The interview process took an average time of 30 minutes for all the interviews.

4.5 Ethical issues

Research projects are expected to follow rigorously ethical considerations when it comes to dealing with human participants. Interviews are considered an intrusion into respondents' private lives with regard to time allotted and level of sensitivity of questions asked; a high standard of ethical considerations should be maintained (Hamza Alshenqeeti, 2014 citing Cohen et al. 2007).

An application for ethical clearance in the College of Education (UNISA) was done (Refer to Appendix 11). After the acquisition of ethical clearance, permission was first sought from the College of Education-UCC prior to embarking on field work (Refer to Appendices 12 and 13). All research instruments and ethical and permission letters were appended to the application, e.g., a consent letter which also introduces the researcher, the purpose of the research, their right to participate or not to participate in the study and assurance of participant's freedom to stop participating in the study if they want to at any point (Refer to Appendices 14 and 15). The

participants were assured that their responses would be kept confidential verbally and in writing (in consent letters). Access to UCC was then sought. The thesis' final text was sent to a recognised language editing expert for proofreading and editing (Appendix 16).

4.6 Reliability and validity of the quantitative instrument

When reviewing a study measurement instrument to obtain reliable information from respondents, reliability is one of the most critical aspects to examine. According to Cohen, Manion and Morrison, (2017), instrument reliability is concerned with the instrument's consistency, and an instrument is said to have high reliability if it can be relied on to provide an accurate and constant measurement of an unchanging value. According to Souza, Alexandre, and Guirardello, (2017), reliability is defined as the degree to which a research collection technique produces consistent results. According to Dore, Marino, Ni, Lomelin-Gascon, Sonis, Amaya, Ryan, Schneider, Jette and Kazis (2018:1753), a researcher can assess reliability by asking three questions: Will the measures produce the same results on subsequent occasions? Will other onlookers come to similar conclusions? Is there any transparency in how the raw data was interpreted? As a result, reliability is worried with the sturdiness of your questionnaire.

According to Crowe and Feinberg (2017), there are four major drawbacks to data collection reliability: subject or participant error, participant bias, observer error, and observer bias. When a researcher instrument is completed at different times by the same people, it is said to be subject to participant error. For instance, students may be asked to complete a questionnaire about how they feel about school on Friday afternoon and again on Monday morning. The outcomes of the completed questionnaires will vary. To avoid participant error, a more neutral time was chosen for this study, when the students were neither on a high nor a low.

When a person is induced to give out certain information during a study instead of the true information, this is known as participation bias (Crowe & Feinberg, 2017). This might be because the participant was caught by his or her superiors ruining their reputation. It could also be due to a feeling of insecurity. This was addressed in the study by ensuring that respondents to surveys were anonymous.

Observer error occurs when a researcher makes a mistake during the measurement process. When there are a lot of observers, observer error becomes a problem. Even when utilizing a precise

measurement tool, each individual has his or her own style of thinking, and without proper training, observers will make different judgments. The interviews were set up in such a way that observer error was kept to a minimum. Observer's bias occurs when different methods are employed to interpret responses to questions posed to participants (Crowe & Feinberg, 2017).

Leedy and Ormrod (2015) propose five different types of reliability. Each of these five types are unpacked below.

4.6.1 Interrater reliability

The degree of agreement between different people witnessing or judging the same object is measured by interrater reliability. It is also known as interobserver reliability (Tinsley & Weiss, (1975:358). According to Belotto (2018:11), when data is collected by researchers who assign ratings, scores, or categories to one or more variables, interrater reliability is used. In studies where a group of researchers collects data on classroom behaviour, interrater reliability is critical. That is, all the researchers must agree on how to label and grade various sorts of conduct. Because people are subjective, their impressions of situations and phenomena will inevitably differ. Reliable research seeks to reduce subjectivity as much as possible so that the same results may be replicated by another researcher (Zapf, Castell, Morawietz & Karch, 2016:2). It is critical to ensure that various people will score the same variable consistently and with little bias when developing the scale and criteria for data collecting. When numerous researchers are involved in data gathering or analysis, this is extremely crucial because of personal bias (Ten Hove, Jorgensen & Van der Ark, 2021). These important researchers perform the same measurement or observation on the same sample to determine interrater reliability. The correlation between their various sets of results is then calculated Ten (Hove, Jorgensen & Van der Ark, 2021). The process has great interrater reliability if all the researchers offer similar ratings. The study's variables and data analysis procedures must be clearly outlined.

According to Sideridis, Saddaawi and Al-Harbi (2018), a measuring instrument's internal consistency is determined by connecting responses to each item in the questionnaire with replies to other questions in the questionnaire. As a result, it assesses the consistency of responses across all of your questionnaire's questions or a subset of them. The same thing must be measured by a set of questions or ratings that will be merged into an overall score (Sideridis, et al. 2018). Internal consistency may be unreliable if responses to various items contradict one another. Internal consistency is measured by determining the correlation between the results of all possible pairs of

items and their averages (Anselmi et al., 2019). The questionnaire was meticulously crafted, and those intended to reflect the same concept should be based on the same theory and formulated with the same care.

4.6.2 Equivalent form reliability

The correlation between two equivalent versions of a test is measured by equivalent form reliability (King et al., 2016). When the same respondents take two distinct versions of a questionnaire assessing the same thing and obtain similar findings in both tests, it is said to have equivalent form reliability (Yun et al., 2018). By comparing replies to alternate formats of the same topic or groups of questions, this provides some insight into the dependability of a study questionnaire. Check questions are used to assess equivalent form reliability. However, ensuring that these questions are essentially equal is frequently difficult (Yun et al., 2018). Respondents may become tired because of the requirement to lengthen the questionnaire, and they may notice a similar question and simply go back to their prior response, distorting the rationale for equal form reliability. As a result, it's advisable to employ check questions only when absolutely necessary. Make sure that all of the questions or test items are based on the same theory and are meant to evaluate the same thing.

As Elliott, Knodt, Ireland, Morris, Poulton, Ramrakha, Sison, Moffitt, Caspi and Hariri (2020:801) mention, test re-test reliability estimates are generated by comparing data from the same questionnaire collected under as close to identical conditions as possible. As a result, the questionnaire was presented twice to separate respondents under the same conditions. This was done to assist the researcher in reaching a high level of test-retest reliability. The time between the two data sets is as short as possible. This strategy is used to supplement the study's existing reliability methods.

On a small scale, the questionnaire was given to 100 students from three departments at the University of Education, Winneba (UEW), which is in the same geographical area as the research site, the central region of Ghana, and has similar institutional characteristics. Prior to its charter, UEW was associated with UCC, and as a result, its organizational ideology, goals, and structures were inextricably linked to those of UCC. UEW's fundamental mandate, like UCC's, is to produce professionals to strengthen the educational sector. I, therefore, implies that there exist enough similarities that justify UEW's consideration in the pilot phase of research instrument development. The 35-item questionnaire was assessed using a five-point Likert scale. The

respondents were given sheets of paper to add to the questionnaire to provide feedback on the clarity, weakness, inadequacy, ambiguity, and difficulties with all aspects of the items in the instrument.

4.6.3 Cronbach alpha reliability coefficient

Cronbach alpha reliability coefficient shows whether the items evaluating a construct have significant similarities in their ratings, or if they are identical in their evaluations (Kiliç, 2016:47). Internal consistency can be calculated using a variety of approaches, with Cronbach's alpha being one of the most popular. The Cronbach's coefficient alpha was most appropriate because the items in the questionnaire were multiple scored on a Likert scale. The Cronbach's alpha was chosen because Taber (2018:1275) believes that the Cronbach's alpha should be employed for measuring multiple-scored items, such as attitudinal scales. Cronbach's alpha is a reliability coefficient that goes from 0 to 1, with higher values indicating better degrees of reliability. It is commonly seen in the same light as composite reliability. The guidelines proposed by Kiliç (2016:48) were used to interpret the reliability which states that if $\alpha \geq .9$ its excellent (high-stakes testing); $.7 \leq \alpha < .9$ it is good (low stakes testing); $.6 \leq \alpha < .7$ it is acceptable; $.5 < \alpha \leq .6$ it is poor and $< .5$ it is unacceptable.

4.6.4 Validity

On the other hand, an instrument's validity refers to how well it measures the notion it is designed to measure (Cohen, Manion & Morrison, 2017:248). They go on to say that an instrument must be dependable before it can be valid, suggesting that it must be consistently repeatable; and that once this is done, the instrument can be evaluated to see if it is what it claims to be. Internal validity in the context of questionnaires refers to a questionnaire's capacity to assess what you want it to measure. This means that what you find with your questionnaire represents the reality of what you are assessing as a researcher. This is a problem because if researchers understood the truth about what they were measuring, there would be no sense in devising and utilizing a questionnaire to collect data. This study circumvents this issue by seeking for other relevant data to back up the answers obtained through the questionnaire, with relevance decided by the nature of the research topic and judgment. Researchers frequently use the terms content validity, criterion-related validity, construct validity, convergent validity, and discriminant validity when discussing the validity of a questionnaire (Taherdoost, 2016:15).

4.6.4.1 Content validity

The degree to which the measurement instrument, in our case the measurement questions in the questionnaire, provides acceptable coverage of the investigative questions is referred to as content validity (Shrotryia & Dhanda, 2019:1). There are several techniques to determine what constitutes sufficient coverage of every participant" Content validity was achieved by carefully defining the research through a review of the literature and prior consultation with my supervisor (Koller, Levenson & Glück, 2017:126). In addition, respondents were asked to complete a pre-test in which they were asked to indicate if each measurement question in the questionnaire is "important," "helpful but not essential," or "not necessary."

4.6.4.2 Predictive/concurrent validity

The ability of the measures (questions) to generate accurate predictions is called predictive validity, which is also known as criterion-related validity (Van Iddekinge, Arnold, Frieder & Roth, 2019:586). This means that if this study uses the measurement questions in the questionnaire to predict how adequate study materials in UCC library are for effective studies or research, then the extent to which they predict these how adequate study materials in UCC library for effective studies or research will be a test of these measurement questions' criterion-related validity. The researcher will compare the results from the questionnaire with the criterion in some way when assessing criterion-related validity. The predictive validity of the model will be tested using correlation.

4.6.4.3 Convergent validity

The scope of many items measuring the same concept agrees on convergent validity (Lekwa, Reddy & Shernoff, 2019:109). Convergent validity can be assessed using factor loadings and the average variance retrieved (AVE) according to Hair Jr, Matthews, Matthews and Sarstedt, (2017:115). Factor loadings should be 0.70 and above to prove convergent validity, according to Taherdoost (2016:14), an AVE score of 0.50 or above shows that the construct explains the majority of the variance in its indicators on a regular basis. An AVE of less than 0.50, on the other hand, implies that more errors remain in the items on a regular basis than the variance explained by the construct.

4.6.4.4 Discriminant validity

Discriminant validity refers to the extent to which a construct is truly distinct from other constructs based on empirical criteria (Shaakumeni & Csapo, 2019). The HeterotraitMonotrait Ratio is a

method for calculating the discriminant validity of an SEM model (HTMT). According to Radomir and Moisescu (2019:145), a latent construct has discriminant validity when its HTMT ratio is less than 0.850. To test discriminant validity, the Fornell Larcker criterion can also be used. It contrasts with the latent variable correlations of the square root of the AVE values (Fornell & Larcker, 1981:48). The square root of the AVE of each construct should be above its maximum correlation with every other construct (Hair Jr, Risher, Sarstedt & Ringle, 2019:59).

4.7 Data analysis

Data Analysis is a process of collecting, transforming, cleaning, and modelling data with the goal of discovering the required information (Hair Jr. et al., 2017). The results so obtained are communicated, suggesting conclusions, and supporting decision-making. Data obtained in this study were subjected to both quantitative and qualitative analyses.

To follow up on the quantitative findings, qualitative data were utilised in this study. Typically, there were two stages to this explanatory design: (1) a quantitative instrument phase, then (2) a qualitative data collecting phase, with the qualitative phase building immediately on the quantitative phase's findings (Schoonenboom & Johnson, 2017).

In this manner, the quantitative findings were explained in more detail through the qualitative data. For example, findings from instrument data about students' information-seeking behaviour in UCC can be explored further with qualitative focus groups to better comprehend how the personal involvements of students compared to the instrument results.

4.7.1 Quantitative analysis

Numeric data collected in this research were analysed quantitatively using statistical tools through descriptive analysis and inferential statistics. Descriptive analysis refers to statistically describing, aggregating, and presenting the constructs of interest or associations between these constructs. Statistical inference involves using sample data to make conclusions about the underlying population (Keller, 2018). The data collected were analysed using IBM Statistical Package for Social Sciences (SPSS) Version 27.0 programme. IBM Statistical Package for Social Sciences (SPSS) was the appropriate software for the analyses in this study as it has been designed to effectively compute descriptive statistics such as mean, mode, frequency amongst others which were employed in the study to help analyse the results and draw conclusions (Kinnear & Gray,

1997; Field, 2016). Secondly, the software has a component called IBM AMOS that is used for performing structural equation modelling. The data was first of all prepared for analysis.

4.7.1.1 Data preparation

In this study, data from student-completed questionnaires was imported into SPSS in a machine-readable, numeric format. Data preparation followed steps of data coding, data entry, detection of missing values and then data transformation.

Data coding refers to the process of transforming data into numeric format. To aid the process, a codebook was created to guide the coding process (Dixon & Woolner, 2012). This is an all-inclusive document containing an exhaustive explanation of each variable in a research study, items or measures for that variable, the format of each item (numeric, text, etc.), the response scale for each item (a five-point scale is being used in this study) and how to code each value into a numeric format. The 5-point Likert scale was coded in such a way that it ranged from strongly disagree with a 1 to strongly agree with a 5.

According to Dixon and Woolner (2012), nominal data in this research such as information type was coded in numeric form using the coding scheme such as: 1 for personal development, 2 for academic information, 3 for employment information and so forth. Ratio scale data such as the academic level of students was coded as entered by the respondent. Sometimes, data is aggregated into a different form than the format used for data collection. For instance, in measuring a construct such as "computer skills," students were provided with a checklist of skills that they could select from (i.e., they could choose as many of those skills as applicable), and then the total number of checked items was used as aggregate computer skills.

Coded data were entered directly into a SPSS. Most statistical programs offer a data editor for entering data. Each observation was imputed as one row in the spreadsheet and each measurement item was signified as one column (Dixon & Woolner, 2012). The data was often checked for correctness through intermittent spot checks on a set of items or observations, during and after entry.

Missing data is an unavoidable part of any empirical data set. Ambiguity or sensitivity of questions may prevent some respondents from answering these questions. Problems of this kind were noticed during the pre-tests and modified prior to the main data collection process. The statistical programs

automatically treated blank entries as missing values once data was imputed. SPSS is popular for its effectiveness in producing relatively unbiased estimates for imputation. A missing value analysis was also carried out. According to Hair et al. (2019:62), if the missing value is 10% or less, it is generally acceptable. In this case, all observations with less than 10% missing information were retained.

Before data values can be usefully evaluated, they must sometimes be transformed. For example, reverse coded items should be reversed (e.g., in a 1-7 interval scale, 8 minus the observed value will reverse the value) before being compared or mixed with things that are not reverse coded. Producing scale measures by adding individual scale items, creating a weighted index from a set of observed measures, and collapsing numerous values into fewer categories are all examples of transformations (e.g., collapsing incomes into income ranges).

In this study composite variables were created by averaging items in a construct. Subedi (2016) indicates that if items in a Likert scale are combined in order to generate a composite score of a set of items for the different participants, then the assigned scale will be an interval scale, and it is necessary to create Likert scale items by calculating a composite score which can either be a sum or mean from four or more Likert items that can be used as parametric the statistic such as the mean for central tendency and standard deviation for the variance. In this study, the composite variables were created by averaging Likert-items in a construct.

4.7.1.2 Descriptive statistics

The type of analyses the data was subjected to was univariate analysis; an analysis of a single variable or a set of statistical procedures for describing the general properties of one variable. Frequency distribution, central tendency and dispersion are some examples of univariate statistics (Denis, 2018). The frequency distribution, as said of a variable, refers to a sum up of the frequency (or percentages) of individual values or ranges of values for that variable (Denis, 2018). For instance, in this study the researcher measured how many times a sample of respondents use the IT laboratory (as intensity of use of IT resources) using a categorical scale: “once a day, 2 times a day, 3 times a day, 4 or more times day, never”. If we count the number (or percentage) of observations within each category and display it in the form of a tables, graphs, etc.

4.7.1.3 Exploratory factor analysis

Exploratory factor analysis is a technique in which the objective is to define the structure within a set of variables, with no pre-specification of number of factors or which variables are part of a factor (Hair et al., 2019:122). Firstly, in order for exploratory factor analysis to be used the minimum absolute sample size should be 50 observations, with 100 observations the preferred minimum (Hair et al., 2019:134). The appropriateness of factor analysis is determined using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett test of Sphericity. The Kaiser-Meyer-Olkin measure of sampling adequacy is used to decide whether or not the sample is adequate for performing factor analysis while the Bartlett's test of sphericity is a second measure of sampling adequacy and it tests for sufficiency of all correlations among all items on the measuring instrument (Matore, Khairani & Adnan, 2019). According to Hair Jr et al. (2019), to conduct an exploratory factor analysis, the following conditions should be met:

- Sample size should be preferably larger than 100 in this case it was 366.
- The majority of the communality which helps in identifying the strength of the factors in explaining each variable and most of the factor analysis should be greater than .6.
- For factor analysis to be adequate the Kaiser- Meyer-Olkin (KMO) measure of sampling adequacy should be greater than .5.
- Bartlett's Test of Sphericity should be significant with p-values less than .05 for the correlations among the variables to be sufficient for performing factor analysis.
- For practical significance, the factor loadings should be above $\pm .5$.
- The latent root criterion to be used to retain factors with eigenvalues greater than 1 and it is one of the stopping rules used to determine the number of factors to retain.
- Robustness of the solution is achieved if the factor solution explains at least 60% of the total variation.

The exploratory factor analysis was done using the principal component analysis with a varimax rotation. Principle component analysis is used if the aim is data reduction which was the case in the study.

4.7.1.4 Inferential statistics

Inferential statistics that were utilised in this are independent-tests and one-way analysis of variance. In order to use the independent t-tests and ANOVA there are assumptions to be met. According to Gravetter and Wallnau (2017:244), the assumptions of the independent t-tests are:

- the observations within each sample must be independent;
- the populations from which the samples were selected must be normal; and
- the populations from which the samples were selected must have equal variances.

The same assumptions also apply to ANOVA. In the study, the observations selected were independent from each other. The data were assumed to be normally distributed by applying the central limit theorem. According to Kwak and Kim (2017:145-146), the central limit theorem indicates that if the sample size is sufficiently large, then the means of samples obtained using random sampling with replacement are distributed normally with mean μ , and variance, σ^2 , regardless of the population distribution. In this case the sample size was large, n that is, the number of cases were 366. The assumption on equal variance was tested on both tests using Levene test for homogeneity. The tests whether a test was significant. The p-value of a test is the probability of observing a test statistic at least as extreme as the one computed given a null hypothesis is true (Keller, 2018:342). A test is considered significant if the p-value is less than .05 and highly significant if it is less than .01.

The effect size was used to measure the significance of the test. The effect size is the strength of a relationship or the degree to which a null hypothesis is false or the magnitude of a difference occurring between two variables (Wrench, Thomas-Maddox & McCroskey, 2016).

4.7.1.5 Independent T-tests

The independent t-test is an inferential test that is used to test whether there is difference between two means based on two independent, unrelated samples (Heiman, 2015; Brace & Brace, 2015, Keller, 2018). When the independent t-test was used, the assumption on equal variances was tested using the Levene test for quality of variance. In the case where the variances were not equal, statistics for equal variances not assumed were used.

The effect size for the independent t-test was defined as:

t^2

$$\eta^2 = \frac{t^2}{t^2 + (N_1 + N_2 - 2)}$$

where:

t^2 = test statistic squared; N_1 is the sample size for the first group, and N_2 is the sample size for second group. The interpretation of the effect size was done using guidelines proposed by Cohen (1988), where:

- .01 = small effect
- .06 = moderate effect
- .14 = large effect

The independent t-test and was used to determine if the views on issues on information needs and seeking behaviour differed by gender.

4.7.1.6 One-way analysis of variance (ANOVA)

The univariate analysis of variance is a hypothesis-testing procedure that is used to evaluate difference in means between two or more populations (Gravetter & Wallnau, 2017). According to Tabachnick and Fidell (2014) ANOVA is based on comparing two estimates of variance where one estimate comes from differences among scores within each group which is considered random, or error estimate and the second estimate comes from differences in group means and is considered a reflection of group differences or treatment effects plus error (Tabachnick and Fidell (2014). The F-test which is the ratio of between groups variance to within group variances is used as the test statistics (Jackson, 2014). Tabachnick and Fidell (2014) indicate that if these two estimates of variance are the same, then one can conclude that all the group means come from the same sampling distribution of means and that the slight differences among them are due to random error. The Levene’s test for equality of variances was used to determine whether the variances were equal. If the assumption was violated, then the Welch robust test of equality of means which is a version of the F-tests was used to test for equality of means (Tabachnick and Fidell 2014). If the means were different then post-hoc tests were done to determine which groups differ in means. Post-hoc test are tests for comparing all possible pairs of groups to determine which ones differ significantly from each other (Jackson, 2014). The Tukey HSD was used as a post hoc test when the variances were equal, and the Games Howell Test was used when the variances were not equal. The effect size for ANOVA when the variances were equal was denoted as eta squared is, η^2 and it was defined as:

$$\eta^2 = \frac{SS_{bet}}{SS_{tot}}$$

where SS_{bet} is sum of squares between groups and SS_{tot} is sum of squares for total. In the case where the variances were not equal, the effect size for the Welch F test was calculated using the adjusted omega squared, (ω^2) given by:

$$\omega^2 = \frac{df_B (F - 1)}{df_B (F - 1) + N_T}$$

where F is the F-test statistic or ratio and N_T is the total number of subjects (Keppel & Wickens, 2004). The guidelines proposed by Cohen (1988) were also used in interpreting the effect size. That is effect size of 0.02, 0.15, and 0.35 indicates small, medium, and large effect respectively. The one-way analysis of variance (ANOVA) was used to determine if the views on issues on information needs and seeking behaviour differed by age and level.

4.7.1.7 Structural equation model (SEM)

Structural equation modelling is a collection of statistical techniques that allow a set of relationships between one or more independent variables which can either be continuous or discrete, and one or more dependent variables which can also be either continuous or discrete to be examined (Tabachnick & Fidell, 2014). The structural equation model consists of two parts which are the measurement part which includes the confirmatory factor analysis and the structural part which is the structural equation modelling. According to Byrne (2016), structural equation modelling is methodological technique that takes a confirmatory (that is hypothesis-testing) approach to the analysis of a structural theory bearing on some theory. Hair *et al.* (2019) proposed a six-stage process for structural equation modelling which is presented in Figure 6.5.

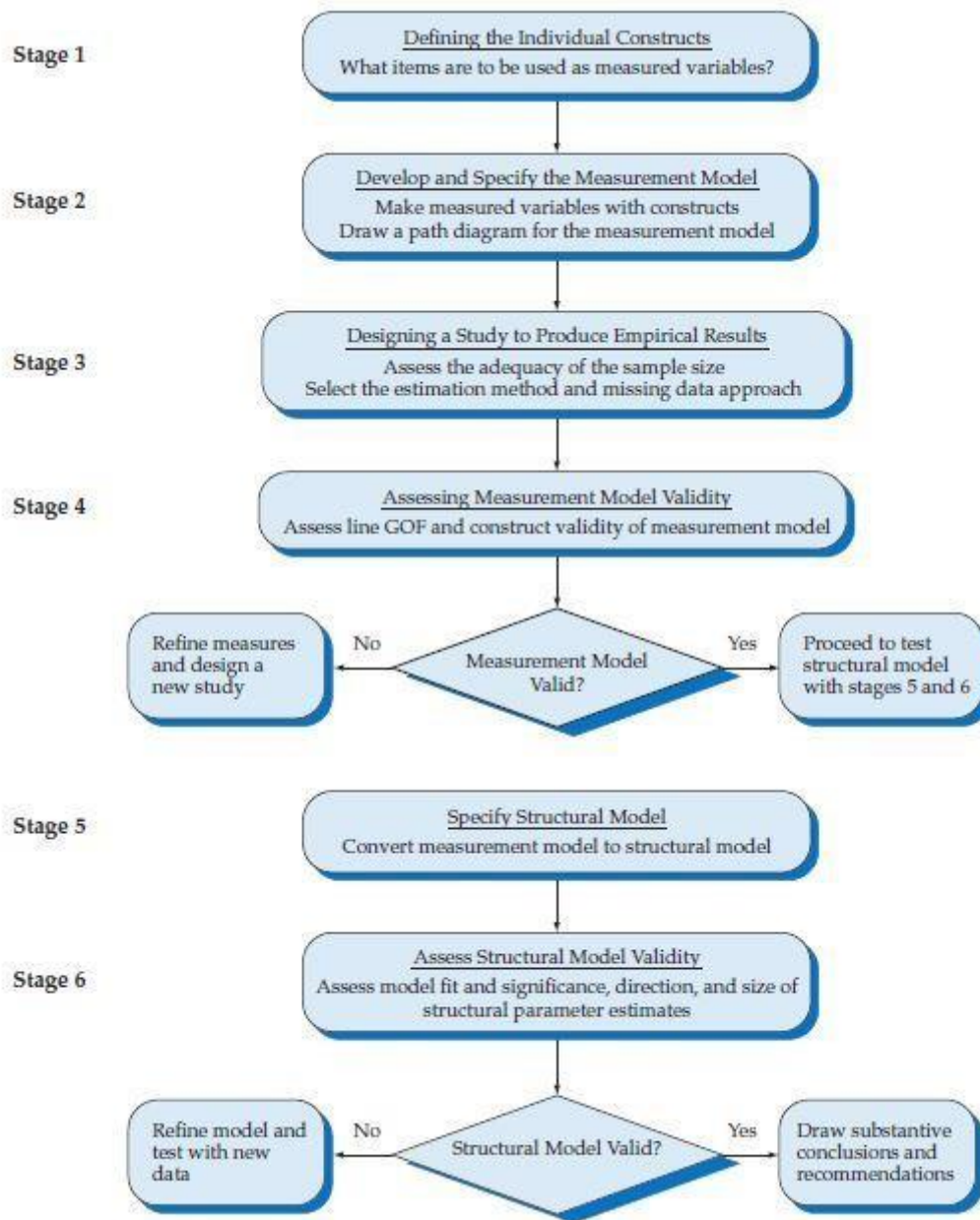


Figure 4.1: Six-stage process for structural equation modelling (Hair et al., 2019:626)

The stages according to Hair Jr et al. (2019) involved:

Stage 1: Involves designing of the questionnaire and it was articulated in section 4.3.4.

Stage 2: Stage 2 involved the development of the conceptual framework for the study. The relationships between the constructs were illustrated with the aid of a path diagram. In this study two conceptual models were developed. The first was the conceptual model for the effect of usage of ICT resources, library resources, support services, and ICT software on students' computer

skills and the second was the model for the effect of usage of ICT resources, library resources, support services, software and computer skills on students' informative seeking behaviour.

Stage 3: The sample size needed for the study was calculated using Krejcie and Morgan's sample size determination table. The missing value analysis was done as proposed by Hair et al., (2019) and the maximum likelihood method was used to estimate both the measurement and structural part. The maximum likelihood method is a robust technique used to estimate both the measurement and structural part and it yields consistent parameter estimates that are most likely to have produced the observed data (Hair et al., 2019: 608).

Stage 4: The measurement model validity is assessed using construct validity. Construct validity is defined as the degree to which a measure relates to other variables as expected within a system of theoretical relationships (Babbie, 2017: 488). Construct validity is made up of nomological, convergent and discriminant validity (Hair et al., 2019). Nomological validity refers to the degree that the summated scale makes accurate predictions of other concepts in a theoretically based model (Hair et al., 2019:162). Nomological validity was assessed using Pearson's correlation coefficient. The purpose was to find out whether the scale demonstrates the relationship shown to exist based on theory or prior research (Hair et al., 2019).

Convergent validity refers to the degree to which scores on a measure correspond to scores on other measures of the same construct, that is, the concept that should be related to each other are in fact related (Rubin & Babbie, 2016; Leedy & Ormrod, 2015). The construct validity was measured using Average Variance Extracted (AVE) and Construct Reliability (CR). Average Variance Extracted (AVE) is a measure of convergent validity which is the degree to which a latent construct explains the variance of its indicators (Hair, Hult, Ringle & Sarstedt, 2017). The Average Variance Extracted is constructed standardised loadings and is given by

$$AVE = \frac{\sum_{i=1}^n L_i^2}{n}$$

where L_i represented the completely standardised factor loading for the i^{th} measured variable and n is the number of item indicators for a construct (Hair et al., 2019:660). In order to achieve

convergent validity all AVEs have to be more than .05, that is, $AVE > .5$ (Hair et al., 2019; Hair, Hult, Ringle & Sarstedt, 2017).

Construct (composite) reliability (CR) is the extent to which the measurement questions actually measure the presence of those constructs you intend to measure (Saunders, et al, 2016: 773) and according to Hair et al., (2019: 676) is calculated as the squared sum of factor loadings (L_i) for each construct and the sum of the error variance terms for a construct (e_i) as:

$$CR = \frac{(\sum_{i=1}^n L_i)^2}{(\sum_{i=1}^n L_i)^2 + (\sum_{i=1}^n e_i)}$$

CR varies between 0 and 1 where higher values indicate higher values of reliability (Hair, Hult, Ringle & Sarstedt, 2017). The authors further indicated it is generally interpreted the same as way as Cronbach alpha and acceptable if it is more than or equal to .7. Convergent validity is reached if all the construct reliabilities are more than their AVEs, that is, $CR > AVE$.

Discriminant validity is the extent to which a construct is truly different from other constructs, in terms of how much it correlates with other constructs, as well as how much indicators represent only a single construct (Hair et al., 2017: 316). The authors further indicated that discriminant validity is assessed using the Fornell-Lacker criterion which compares the square root of each construct's average variance extracted with its correlations with all other constructs in the model. The criterion is that (1) the maximum shared variance (MSV) is less than AVE (2) average shared variance (ASV) is less than AVE and (3) the AVE is greater than the squared inter-construct correlations (SICs).

After the assessment of the construct validity then the goodness of fit of the model is assessed. According to Hair et al (2019) the methods for assessing goodness of fit are categorised into three types which are absolute fit indices (AFI), incremental fit indices (IFI), and parsimony fit indices (PFI).

- Absolute fit indices

The absolute fit indices are the:

o the chi-square, o normed chi-square, o goodness of fit index (GFI), o root mean square error of approximating (RMSEA), o root mean square residual (RMR), and o standardised root mean residual (SRMR).

- Incremental fit indices

The incremental fit indices (IFI) are:

- o Normed Fit Index (NFI),
- o Tucker Lewis Index (TLI),
- o Comparative Fit Index (CFI), and
- o Relative Non-centrality Index (RNI).

- Parsimony fit indices

The Parsimony Fit Indices (PFI) are:

- o Adjusted Goodness of Fit Index (AGFI), and
- o Parsimony Normed Fit Index (PNFI).

The following cut-off criteria for model fit as proposed by Hu and Bentler (1999), Gaskin and Lim (2016) and Hair, et al (2019) were used to evaluate the measurement model and the structural model.

Table 4.10: Cut-off criteria for the fit indexes commonly reported for CFA and SEM

Measure	Name	Cut-off for acceptable fit	Cut-off for good fit
χ^2	Model Chi-Square		p-value > .05
CMIN/DF χ^2 () df	Chi-square value and its associated degrees of freedom statistic	Between 3 and 5	Between 1 and 3
GFI	Goodness of Fit	$.90 \leq GFI \leq .95$	$GFI \geq .95$
RMSEA	Root Mean Square Error of Approximation	$.08 < RMSEA < .06$	$RMSEA < .06$
SRMR	(Standardized) Root Mean Square Residual	$.10 < SRMR < .08$	$SRMR < .08$

Measure	Name	Cut-off for acceptable fit	Cut-off for good fit
AGFI	Adjusted Goodness of Fit	$AGFI \geq .90$	$AGFI \geq .90$
CFI	Comparative Fit Index	$.90 \leq CFI \leq .95$	$CFI \geq .95$
(N)NFI	(Non) Normed-Fit Index	$.90 \leq NFI \leq .95$ $.90 \leq NNFI \leq .95$	$NFI \geq .95$ $NNFI \geq .95$
TLI	Tucker Lewis index	$.90 \leq TLI \leq .95$	$NFI \geq .95$
PClose	p-value for testing the null hypothesis that the population RMSEA is no greater than .05	$.01 \leq PClose \leq .05$	$PClose > .05$

Source: Hu and Bentler (1999), Gaskin and Lim (2016) and Hair Jr et al. (2019)

According to Gaskin and Lim (2016), a combination of measures where $CFI > .95$ and $SRMR < .08$ is a good combination which can be solidified further by $RMSEA < .06$. Hu and Bentler (1999) propose a two-index presentation strategy which is shown in Table 4.11.

Table 4.11: Hu's and Bentler's two-index presentation strategy (1999):

Fit index combination	Combination rules
RMSEA and SRMR	RMSEA of .06 or lower and a SRMR of .09 or lower
CFI and SRMR	CFI of .96 or higher and a SRMR of .09 or lower
NNFI (TLI) and SRMR	NNFI of .96 or higher and an SRMR of .09 or lower

Source: Hu and Bentler (1999); Hooper, Coughlan and Mullen (2008)

According to Hair et al. (2019), one can use one incremental index, one absolute index in addition to the chi-square value and its associated degrees of freedom and they proposed the use of three to four fit indices to provide evidence of model fit.

Stage 5: Involves converting the measurement model from the confirmatory factor analysis into a structural model.

Stage 6: Involves validation of the structural model by evaluating the goodness of fit statistics and their significance, direction, and size of structural parameter estimates. These stages were used to examine the conceptual model by determining the relationship of the structural model.

4.7.2 Qualitative analysis

Information obtained from these responses and obtained from the interview process were analysed while reviewing the literature, to help the researcher obtain in-depth information on the topic under study. Responses that connote the same ideas were put together and discussed as key issues that emerged from the discussion.

Qualitative data analysis for the study considered the conventional procedures as presented by Leedy and Ormrod (2001). Their study described this procedure as one consisting of an initial phase of data gathering using research instruments followed by the reduction of large bodies of textual information into smaller units in line with particular themes while analysing the entire data set to comprehend the information obtained. In order to make the study as reliable as possible, the researcher triangulated the data. Secondary data were reviewed and compared with the information obtained from the interview through discussion. Issues were discussed according to the research questions of the study and as well establishing findings and a general conclusion in each instance in accordance with the theories and concepts. During data analyses, words, context, internal consistency, frequency of comments, specificity, information gaps and quest for the better ideas were considered. Particular themes were examined on how they related to the variation among the participants of the study.

Accordingly, following data capturing from the interviews, the large pool of information gathered was summarised according to particular themes while thoroughly going through the entire summaries several times to get the meaning of the information obtained (Leedy & Ormrod, 2001). Issues were discussed according to the research questions of the study and as well establishing findings and a general conclusion in each instance in accordance with the theories and concepts. Information gaps and quest for the better ideas were considered while examining particular themes and their relationships with differences in views of the participants interviewed. According to Weinreich (2009), the aim of qualitative research is to deliver the researcher with the standpoint of target audience members through engagement in a culture or circumstances and direct collaboration with the people under study. The findings of the current study are triangulated as

part of the discussion in Chapter 6, after the quantitative and qualitative parts were analysed individually.

4.7.3 Trustworthiness of the study

As part of the researcher's assurance to developing his fixed ideas prior to and during the research process and as well accounting for issues of bias in this study, the researcher employed the method of bracketing vis-a-vis some aspects of Guba's Four Criteria for Trustworthiness. The former was guided by the definition of bracketing provided by Al Hashlamoun (2020:4).

4.7.3.1 Bracketing

According to the Al Hashlamoun and Daouk (2020), bracketing is a technique used in qualitative research to moderate the potentially harmful effects of presumptions that may flaw the research process. They emphasised three bracketing methods namely memoing, engaging in interviews with an outside source, and journaling. However, memoing and journaling approaches were employed as described by Ahern (1999) as reflexive journal. Al Hashlamoun and Daouk (2020) cautions that qualitative researchers should be considerate whether the type of bracketing is suitable for themselves and for the targeted research area for investigation. In addition, the methods of bracketing may supplement one another.

A prerequisite technique to memoing employed by the researcher was the coding process. This was in line with Bailey's definition of the process as the organization of a large amount of data into smaller segments for easy retrieval when needed (Ara, 2019). During the process of memoing the researcher wrote notes to himself regarding the coding, including reflections on the data. These included attempts to operationalize definitions, questions, and answers revealed in the data.

4.7.3.2 Journaling

According to Ahern (1999), the process begins before defining the research question, in which presumptions are then acknowledged through the research process. For instance, the researchers' reasons for undertaking the current research were presented in the introductory chapter of the study (refer to Chapter One). Another instance has to do with potential role conflicts with research participants (Refer to Section 4.5); and the type of narration the researcher chooses to write in as explained by Porter (1993). In this current research the third person narration was employed to enable readers to see into the minds of participants and researcher to create a stronger relationship and bond with them.

According to Meyer and Willis (2019:582), reflexive journaling may raise the researcher's consciousness of the topic in daily life and bring it to a level of awareness before he or she assume the research endeavour. Accordingly, this approach has improved the researchers' ability to sustain a reflexive stance.

4.7.3.3 Guba and Lincoln's four criteria of trustworthiness

Guba and Lincoln (1994) four rigours of trustworthiness are based on establishing credibility, transferability, confirmability, and dependability, among other things. The term "rigour" refers to the standards that a qualitative research project must meet (Guba & Lincoln, 1994).

Credibility refers to how confident the qualitative researcher is in the truth of the research study's findings. In this regard, the researcher use triangulation to show the research study's findings are credible (Refer to Chapter 6).

Transferability refers to how the qualitative researcher exhibits that the research study's findings are applicable to other contexts or related circumstances, similar populations, and similar phenomena. In the current study, the researcher used thick descriptions to show that the research study's findings can be applicable to other contexts, population, and occurrences (Refer to Chapters 4 sections 4.3.2, 4.3.2.1, 4.3.2.2, 4.3.2.3 and 4.3.4), 5, 6 and 7).

Confirmability refers to the degree of neutrality in the research study's findings. Therefore, to make sure that the findings are based on participants' responses and not any potential bias or personal motivations of the researcher, it was ensured that the researcher bias does not skew the interpretation of what the research participants said to fit a certain narrative. Records on raw data were kept well to provide a rationale for the decisions made (Guba & Lincoln, 1994). This helped establish that the research study's findings accurately portray participants' responses (Refer to Appendices 1 to 7).

Dependability refers to the extent that the study could be repeated by other researchers and that the findings would be dependable. Applicably, the replication of a study, demands that the researcher should have sufficient information from his or her research report to be able to do so and obtain similar findings as his or her study did (Guba & Lincoln, 1994). The research used inquiry audit to establish dependability, where the supervisor reviewed and examined the research process and the data analysis to ensure that the findings are consistent and could be repeated. This

is followed by the same process to be carried out by an external review panel of the institution for which the research is presented to.

4.8 Conclusion

The integration of quantitative and qualitative data in the form of a mixed methods study has great potential to strengthen the rigour and enrich the analysis and findings of the study. Cautious selection of the mixed method designs that best suit. The researcher's questions and meets its resource constraints, enabled the researcher to facilitate more meaningful learning regarding the effectiveness and implementation of information models. The chapter has critically assessed the value and limitations of the use of types of interviews namely structured, semi-structured and unstructured. Subsequently, the semi-structure face to face digital approach interview was endorsed as the best to use for the study based on the rationalisations above on interviews. Despite numerous research on using interviews, it might be accompanied with a number of conceptual problems that need to be constantly considered. It could therefore be recommended that researchers should consider developing skills of using and analysing interviews. To sum up, researchers should, however, choose the method that answers their research questions best, ensuring accuracy in analytical processes which also ensures more accurate findings. The overall design of the study ensures that the respondents are not denied their subjective views on the phenomena being studied and as well guarantees the objectivity of the whole research activity. Chapter five presents the findings of the study.

Chapter Five

Presentation of Findings

5.1 Introduction

This study was to examine the information needs and information-seeking behaviour of UCC undergraduate education students with respect to their utilisation of ICT laboratory and library facilities. Furthermore, the study explored the participants' opinions on strategies for improving these services to promote effective learning and research. To gather empirical data to answer the research questions, the explanatory mixed method design was employed. Three hundred and sixty-six ($n = 366$) students participated in this study by answering the questionnaire. There was a 100% response rate on questionnaires for all the participants. The 100% response rate in this research may be due to the researcher's self-administration of the questionnaires from which the students were pre-notified on the actual date prior to the collection of data. Five students and five librarians also participated in the interviews despite having tight schedules of lectures and meetings respectively in the college. Data were also collected through document analysis. The study was informed by the following objectives:

1. To explore the kinds of information needed by the undergraduate students at UCC.
2. To examine the types of information resources that are utilised by the undergraduate students of the institution under study.
3. To investigate the various strategies the undergraduate education students, employ in seeking information resources at UCC.
4. To ascertain the efficiency of ICT resources, including the library, to students at UCC with respect to promoting sound learning and research work.
5. To identify ways of improving strategies for satisfying information needs and seeking behaviour of the undergraduate students at UCC to promote sound learning and research work.

The chapter presents the findings from the quantitative data of the study in accordance with the analysis method outlined in Chapter Four followed by the qualitative analysis. For the quantitative analysis, the reliability of the instrument was assessed using Cronbach alpha. The data presentation was done using descriptive statistics (frequencies and percentages). The findings from the demographic data are presented first followed by the descriptive statistics of the constructs in the

study. Exploratory factor analysis is then discussed to determine which variables are highly correlated in the constructs. Composite variables were constructed by averaging items in a construct and then the composite variables were used in comparative analysis. The comparative analysis was done using the independent t-tests and one-way analysis of variance ANOVA. The independent t-test was used to determine whether gender had an impact on issues on information needs and information-seeking behaviour. One way analysis of variance was used to determine the effect of age and level on issues on information needs and information-seeking behaviour. Afterwards, two models were fitted to the data using structural equation model. The first model presented was to determine the determinants of computer skills of students and the second model was to determine the information-seeking behaviour of students. The models were done using structural equation modelling. The findings from the qualitative data in the second section present the findings from the interviews held with students and librarians. For the purpose of ease of discussion in the subsequent chapter, responses that connote the same ideas were put together.

5.2 Reliability of the study constructs

Cronbach alpha (α) was used to determine the reliability of the instrument, that is, its internal consistency. The guidelines proposed by Kiliç (2016:48) were used to interpret the reliability which states that if $\alpha \geq .9$ its excellent (high-stakes testing); $.7 \leq \alpha < .9$ it is good (low -stakes testing); $.6 \leq \alpha < .7$ it is acceptable; $.5 < \alpha \leq .6$ it is poor and $< .5$ it is unacceptable. The Cronbach alpha reliability results are shown in Table

Table 5.1: Reliability results for the constructs

Construct	No. of items	Cronbach's alpha	Acceptable level
Q3. Access of information	7	.610	Acceptable
Q5. Sources of academic information	11	.672	Acceptable
Q10. Usage of ICT Resources	11	.751	Good
Q11. Computer skills of students	17	.847	Good
Q12. ICT Software	7	.684	Acceptable
Q14: Information-seeking behaviour	3	.615	Acceptable
Q20. ICT Support services	7	.837	Good
Q28. Usage of library resources	6	.911	Excellent

Construct	No. of items	Cronbach's alpha	Acceptable level
Q32. Problems in usage of ICT resources	7	.781	Good
Q33. Problems in usage of library resources	6	.810	Good
Q34. Possible solution in use of library and ICT resources	9	.837	Good

The item “*IFR2 I normally access information from internet (online databases, emails, etc.)*” had a downward effect of the reliability of the construct ‘access information’. After it was removed, the reliability increased to .610 which is acceptable. The construct students’ information needs had three items and all of them were not reliable and was removed from the analysis resulting in the model on determinants of student information needs not being tested. The constructs on strategies used to seek information resources with seven items and the one on accessing information for assignments with three items had low reliabilities and were dropped from the analysis. Information-seeking behaviour had four items and the item “(PESQE1 I normally prepare for quizzes and end of semester examinations by studying lecture notes)” had low reliability and was dropped from the analysis. The constructs with acceptable reliability were *access of information*, *sources of academic information*, *ICT Software* and *information-seeking behaviours*. All the remaining constructs had reliabilities of at least 0.7. According to Hair Jr, Howard and Nitzl (2020:161) the reliability can decrease to .60 in exploratory research. In summary, the Cronbach alpha reliabilities were between .610 and .911 which is acceptable and thus the instrument was reliable data and can be used for further data analysis.

5.3 Demographic characteristics of the respondents

The first item under the demographics of the respondents is about the students’ academic year as presented in Table 5.2.

Table 5.2: Demographics characteristics of the respondents (n=366)

Item	Frequency	%
Gender Male	153	41.8
Female	213	58.2

Item	Frequency	%	
Age	=< 20 years	15	4.1
	21 -25 years	317	86.6
	26 - 30 years	34	9.3
Academic year			
100	90	24.6	
200	90	24.6	
300	90	24.6	
400	96	16.2	

Table 5.1 shows that majority of the respondents, that is, 58.2% (n=213) were female students while 41.8% (n=153) were male students. Female respondents outnumbered the male respondents by 16.4% though the selection was done randomly to obtain approximately equal numbers of male and female respondents. There is a reflection of the high rate of female participation in education in the country (Atuahene & Owusu-Ansah, 2013).

According to the data in table 5.1, the majority of the respondents (86.6%, 317) were within the age range of 21 and 25 years, followed by the 26 and 30 age categories with 9.3% (n=34) and those who are not more than 20 years old constituted 4.1% (n=15). The findings show that most of the participants were between 21 and 25 years with a significant few of 4% being teenagers. This is of significance to the study as the youth in the world today could be considered more enthused with the use of technology especially in the area of information-seeking (Joshi, Stubbe, Li & Hilty, 2019). It is therefore expected that the responses obtained reflect the opinions of highly potential information-seekers and users. According to table 5.1, the number of respondents to the questionnaires were uniformly distributed across the various academic years and levels. A response rate of 100% (366 respondents) was realised. This possibly signifies that the participants of the study either had much interest in the study and/or the researcher was able to communicate well the importance of the study to them.

5.4 Descriptive statistics of the variables

The variables were classified into four areas which were (1) information needs and types of information resources utilised by the undergraduate students, (2) strategies employed by undergraduate education students in seeking information resources at UCC, (3) efficiency of

UCC’s ICT resources to students with respect to promoting sound learning and research work and (4) possible solution to the problems faced by students in usage of library and ICT resources. All the constructs had items measured on a Likert scale with an agreement scale ranging from 1 (strongly disagree) to 5 (strongly agree).

For ease of discussion, the percentages for response options “strongly agree” and “agree” were combined to give those in agreement with the statement in interpretation but not in the tables. The same was done in the case of “strongly disagree”, and “disagree” to give those that disagree with the statement. A proportion of at least 50 % indicates that the respondents agreed with the statement. The descriptive statistics will be discussed in the following sub-sections.

5.4.1 Information needs and types of information resources utilised by the undergraduate students

The students were asked to indicate the kind of information needed by the undergraduate student at UCC and the types of information resources utilized by the undergraduate. The information is presented in Table 5.3 and 5.4 respectively.

There were eight items assessing where students obtain information from. “Discussion with librarians” was dropped due to low reliability and the remaining items are shown in table 5.3 (see Appendix 8 for detailed questionnaire – Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), Strongly Disagree (SD)).

Table 5.3: Student’s opinion on accessing information

Item	Level of agreement				
	SA	A	N	D	SD
I normally access information from:					
Discussion with fellow students	63.4%	28.7%	4.1%	2.7%	1.1%
	(232)	(105)	(15)	(10)	(4)
Discussion with lecturers and assistants (184)	50.3%	32.8%	10.4%	3.3%	3.3%
and teaching (120) (38)				(12)	(12)
Reference sources	25.1%	56.8%	15.3%	1.4%	1.4%
	(92)	(208)	(56)	(5)	(5)

Item	Level of agreement				
	SA	A	N	D	SD
Media (newspapers, magazines, TV, radio, etc.)	34.4% (126)	36.6% (134)	18.0% (66)	4.6% (17)	6.3% (23)
Journals	22.7% (83)	31.4% (115)	24.9% (91)	19.4% (71)	1.6% (6)
Conference proceedings	11.5% (42)	31.4% (115)	26.8% (98)	15.6% (57)	14.8% (54)
Internet (online databases, email, etc.)	14.8% (54)	26.5% (97)	17.5% (64)	23.5% (86)	17.8% (65)

Five out of seven items had levels of agreement of at least 50%. For students' opinions on where they normally access information from, "discussion with colleagues" received the highest endorsement (92.1% of respondents) as shown in Table 5.3 above. The items "discussion with lecturers and teaching assistants", "information from reference sources", "information from media (newspapers, magazines, TV, radio, etc.)" followed closely with 83.1%, 81.9%, and 71% endorsements respectively. The least endorsed was "information from journals" which received 54.1% endorsements. The findings indicate that generally, the students access information from the discussions with their colleagues. This could mean that students are better informed of academic information through discussions with their colleagues than through accessing library resources. The items "conference proceedings" and "Internet (online databases, email, etc.)" had 42.9% and 41.3% respondents that agreed respectively. These are the least resources which students normally access information from.

There were 11 items assessing the major sources of academic information in the university as shown in Table 5.4.

Table 5.4: Student's opinion on major sources of academic information

Item	Level of agreement				
	SA	A	N	D	S
The major sources of academic information at UCC are:					
Discussion with colleagues	59.3%	37.7%	1.9%	.8%	.3%
	(217)	(138)	(7)	(3)	(1)
Internet (online databases, email, etc.)	50.3%	44.5%	5.2%	-	-
	(184)	(163)	(19)		
Lecture notes and handouts	60.7%	32.0%	1.1%	2.2%	4.1%
	(222)	(117)	(4)	(8)	(15)
Discussion with lecturers /Teaching Assistants	50.3%	38.8%	5.7%	2.2%	3.0%
	(184)	(142)	(21)	(8)	(11)
Textbooks	42.6%	44.3%	12.0%	-	1.1%
	(156)	(162)	(44)		(4)
Consulting and photocopying colleagues' notes	26.5%	37.7%	9.8%	6.3%	19.7%
	(138)	(36)	(23)	(97)	(72)
Electronic Journals	10.7%	43.2%	20.2%	15.6%	10.4%
	(39)	(158)	(74)	(57)	(38)
Thesis and Dissertations	14.2%	39.3%	26.8%	13.1%	6.6%
	(52)	(144)	(98)	(48)	(24)
Print Journals	6.0%	44.5%	16.4%	21.0%	12.0%
	(22)	(163)	(60)	(77)	(44)
Newspapers	17.8%	32.2%	27.6%	17.5%	4.9%
	(65)	(118)	(101)	(64)	(18)
CD-ROMs database	8.2%	21.3%	33.1%	20.5%	16.9%
	(30)	(78)	(121)	(75)	(62)

Summing up all respondents' opinions on "the major sources of academic information in the university, "discussion with colleagues" and "internet "was deemed the most utilised source as shown in Figure 5.3, with endorsements of 97% and 94.8% respectively. The items "lecture notes and handouts", "discussion with lecturers / teaching assistants", "textbooks" and "consulting and

photocopying colleagues' notes" also attracted respective endorsements of 927%, 89.1%, 86.9% and 64.2% from the students. Other sources of academic information which received average endorsements were "electronic journals" (53.9% of respondents), "thesis and dissertations" (53.5% of respondents), "print journals" (50.5% of respondents) "newspapers" (50% of respondents), and the least being CD-ROMs database (29.5% of respondents). The above findings indicate that the major among other sources of academic information in the university is discussion with colleagues and internet. It could be deduced from the findings that the internet may be more convenient to supplement in their search for academic information (Puspita & Rohedi, 2018).

5.4.2 Strategies employed by undergraduate education students in seeking information resources at the UCC

Table 5.5 below provides the time spend on seeking information.

Table 5.5: Student's opinion on the strategies employed in seeking information (n=366)

Item	Level of occurrence				
	4 or mtd	3 td	2 td	1 td	N
I normally make use of ICT resources for searching for information	8.7% (32)	10.4% (38)	9.6% (35)	36.3% (133)	35.0% (128)
I normally make use of library resources for searching for information	9.8% (36)	13.9% (51)	3.3% (12)	35.0% (128)	38.0% (139)

Key: 4 or mtd (4 or more times a day); 3 td (3 times a day); 2 td (2 times a day), 1 td (1 times a day), N (Never).

The majority of the students indicated that they normally make use of the ICT resources for searching information per day with 36.3% doing it once per day, 9.6% twice, 10.4% thrice and 8.7% four or more times a day. However, 35% indicated that they never make use of ICT resources in searching information. The same pattern was observed for making use of the library resources in searching information. Only 38% indicated that they have never used the library in sourcing for information.

The students were asked to indicate the level of knowledge they possess in using ICT resources and Figure 5.1 shows the proportions.

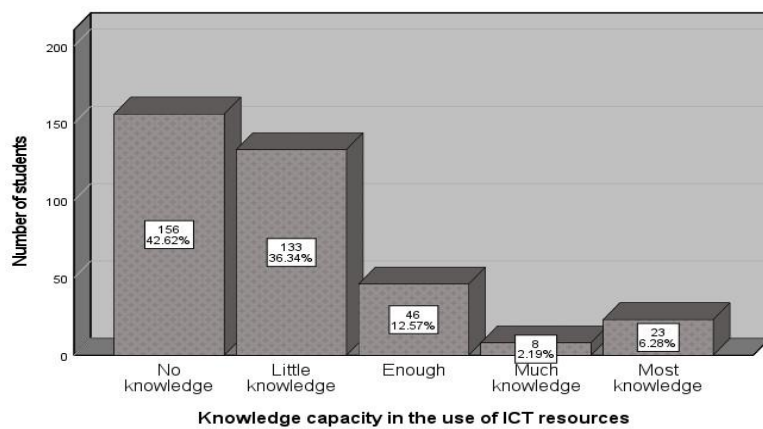


Figure 5.1: Knowledge of the use of ICT resources

The majority of the respondents indicated that they had no knowledge (42.6% of the respondents) or little knowledge (38.3% of the respondents). On the other had 12.6% indicated they had enough knowledge, 2.2% had much knowledge and 6.3% had the most knowledge in use of ICT resources. The respondents were asked to indicate the type of activity they normally do as presented in Table 5.6.

Table 5.6: Student’s opinion on strategic ICT resources employed in searching for Information

Item	Level of agreement				
	SA	A	N	D	SD
I normally browse the internet in my search for information	61.2% (224)	32.8% (120)	3.0% (11)	1.1% (4)	1.9% (7)
I normally use computers in my search for information	62.0% (227)	23.8% (87)	6.3% (23)	4.9% (18)	3.0% (11)
I normally use networking in my search for information	30.9% (222)	44.0% (117)	10.7% (39)	10.1% (37)	4.4% (16)
I normally use telephones in my search for information	36.1% (132)	36.9% (135)	15.8% (58)	3.6% (13)	7.7% (28)

Item	Level of agreement				
	SA	A	N	D	SD
I normally access my e-mail in my search for information	32.8% (120)	34.4% (126)	13.9% (51)	13.7% (50)	5.2% (19)
I normally watch television in my search for information	17.5% (64)	35.0% (128)	17.8% (65)	13.1% (48)	16.7% (61)
I normally use photocopiers in my search for information	19.4% (71)	28.4% (104)	23.8% (87)	11.5% (42)	16.9% (62)
I normally listen to the radio in my search for information	17.2% (63)	27.3% (100)	16.1% (59)	23.8% (87)	15.6% (57)
I normally use printers	13.1% (48)	30.3% (111)	19.9% (73)	18.6% (68)	18.0% (66)
I normally use CD-ROM	9.8% (36)	20.5% (75)	29.2% (107)	17.8% (65)	22.7% (83)
I normally use scanners in my search for information	9.8% (36)	10.7% (39)	27.9% (102)	27.3% (100)	24.3% (89)

Summing up all respondents' opinions on the activities normally done, the most predominant was that they "normally browse the internet in search of information" and "normally use the computer in search of information" with endorsements of 94% and 85.8% respectively. The items "I normally use networking in my search for information", "I normally use telephones in my search for information" and "I normally access my e-mail in my search for information" also attracted respective endorsements of 74.9%, 73% and 67.2% from the students. Other activities which received lower endorsements were "I normally watch television in my search for information" (52.5% of respondents), "I normally use photocopiers in my search for information" (47.8% of respondents), "I normally listen to the radio in my search for information" (44.5% of respondents) "I normally use printers" (43.4% of respondents), "I normally use CD-ROM" (30.3% of the respondents) and the least being I normally use scanners in my search for information (20.5% of respondents). The above findings indicate that the students normally browse the internet and use the computer for information search (Kurt & Emirolu, 2018).

There were 17 items assessing the student level of computer skill as shown in Table 5.7.

Table 5.7: Student's computer skills employed in seeking information resources

Item	Level of agreement				
	SA	A	N	D	SD
I can double click a mouse button	76.8% (281)	22.1% (81)	-	1.1% (4)	-
I am able to use the mouse to open windows	69.1% (253)	29.0% (106)	.8% (3)	1.1% (4)	-
I can single click a mouse button	74.3% (272)	23.8% (87)	1.1% (4)	.8% (3)	-
I can save work from pen drive to computer	73.4% (265)	24.1% (87)	1.1% (4)	.3% (1)	1.1% (4)
I can save work from computer to pen drive	72.7% (266)	23.5% (86)	2.2% (8)	1.6% (6)	-
I am able to minimize a window from a task bar	58.5% (214)	37.4% (137)	1.9% (7)	-	2.2% (8)
I am able to close a window from a taskbar	46.1% (166)	47.5% (171)	.6% (2)	1.7% (6)	4.2% (15)
I can use the mouse to select icons	68.0% (249)	22.7% (83)	3.3% (12)	3.0% (11)	3.0% (11)
I can perform functions such as using the start button to launch programme	43.7% (160)	46.2% (169)	6.8% (25)	3.3% (12)	-
I am able to save work on hard drive	54.9% (201)	33.3% (122)	3.6% (13)	3.6% (13)	4.6% (17)
I am able to restore a window from a task bar	51.6% (189)	35.5% (130)	7.4% (27)	2.2% (8)	3.3% (12)
I am able to save work in appropriate named file	54.4% (199)	31.1% (114)	5.7% (21)	3.6% (13)	5.2% (19)
I can browse very well	52.7% (193)	29.5% (108)	8.5% (31)	4.9% (18)	4.4% (16)

Item	Level of agreement				
	SA	A	N	D	SD
I am able to print using the print button on the software tool bar	52.3% (190)	27.5% (100)	7.4% (27)	8.5% (31)	4.1% (15)
I am able to name work on hard drive before saving	49.5% (181)	29.0% (106)	7.7% (28)	9.8% (36)	4.1% (15)
I am very good at typing	23.8% (87)	51.4% (188)	17.2% (63)	7.7% (28)	-
I normally use all the keys on the computer keyboard	22.4% (82)	33.3% (122)	18.6% (68)	16.7% (61)	9.0% (33)

No respondent disagreed on any issue. The levels of agreement ranged from 55.7% to 98.9%.

In total, respondents' opinions showed that they can "double click a mouse button", "able to use the mouse to open the window", "single click a mouse button", "save work from pen drive to computer", "save work from computer to pen drive" and "minimize a window from a taskbar" with endorsement from 98.9%, 98.1%, 98.1%, 97.5%, 96.2%, and 95.9% respondents. The finding revealed students' ability to use the mouse and also save information. The students also indicated that they were able to close a window from a taskbar (93.6% of the respondents), "use the mouse to select icons" (90.7% of the respondents). The items "I am very good at typing" and "I normally use all the keys on the computer keyboard" were the least endorsed with proportions of 75.2% and 55.7% respectively. Table 5.8 presents seven items on ICT software.

Table 5.8: ICT software employed by undergraduate education students in seeking information resources

Item	Level of agreement				
	SA	A	N	D	SD
I normally use...					
Internet	63.4% (232)	31.4% (115)	4.1% (15)	0	1.1% (4)

Item	Level of agreement				
	SA	A	N	D	SD
Word processing	29.0% (106)	59.0% (216)	8.2% (30)	2.7% (10)	1.1% (4)
Presentation software, e.g. Power Point	36.6% (134)	49.7% (182)	7.7% (28)	3.6% (13)	2.5% (9)
E-mail	50.0% (183)	36.3% (133)	12.3% (45)	1.1% (4)	.3% (1)
Spread sheet	17.8% (65)	54.4% (199)	15.8% (58)	6.6% (24)	5.5% (20)
Data base management system	13.7% (50)	38.5% (141)	24.0% (88)	21.3% (78)	2.5% (9)
Desktop publishing	15.3% (56)	35.0% (128)	27.9% (102)	12.6% (46)	9.3% (34)

In Table 5.8, no respondent disagreed to the use of internet. Collectively 94.8% confirmed the usage of internet application software and 88% of respondents confirmed their usage of word processing application software compared to the others. These were followed by presentation software (e.g. PowerPoint) application software (86.3% of respondents), e-mail application software (86.3% of respondents), spread sheet application software (72.2%), database management system application software (52.2% of respondents) and desktop publishing application software (50.3% of respondents). This finding indicates that most students were familiar with the internet, word application software and utilisation of the same than other types of software. A further deduction could be the high extent to which assignments and term papers presented in printed formats using the word application software have been made compulsory.

Table 5.9 below provides the analysis of students' opinions on the "internet" as source of information for their assignment. The item "studying lecture notes" had low reliability and was removed from the analysis.

Table 5.9: Student's opinion on information-seeking behaviour

Item	Level of agreement				
	SA	A	N	D	SD
I normally prepare for quizzes and end of semester examinations by					
Discussion with colleagues	70.5% (258)	28.4% (104)	1.1% (4)	0	0
Studying information on subject	60.1% (115)	31.4% (15)	4.1% (8)	2.2% from the internet	2.2% (8)
Studying information on subject	48.9% (179)	27.0% (99)	12.0% (44)	9.8% from library materials	2.2% (8)

In Table 5.9, no respondent disagreed. The majority of the respondents were of the view that they normally prepare for quizzes and end-of-semester examinations by discussions with colleagues. The study of information about the subject from the internet in this regard were also greatly endorsed by 91.5% of the respondents. A significant number of respondents (75.9% of respondents) were of the view that they normally prepare for quizzes and end-of-semester examinations by studying information on subjects from the library materials. The finding shows that the students' common way of normally preparing for quizzes and end-of-semester examinations is by discussions with fellow students. A possible reason for this popular mode of preparing for quizzes and end-of-semester examinations by students could be ascribed to the reason that lecturers normally set questions to cover what they have taught in class. Therefore, a safe way to capture most of the issues covered could be relying on the opinions of colleagues who were present and also update notes should there be errors or omissions in them. In addition, group discussions help draw ideas from different viewpoints because each student possess a unique skill and ability. This will enable problem solving to be analytical and creatively (Nugteren, Jarodzka, Kester & Van Merrienboer, 2018; Zambrano Kirschner, Sweller & Kirschner, 2019).

5.4.3 Efficiency of UCC's ICT resources to students with respect to promoting sound learning and research work

Table 5.10 below provides the analysis of students' opinions on whether they normally access ICT resources in the UCC IT laboratory and whether the resources are enough.

Table 5.10: Student's opinion on accessing and efficiency of ICT resources

Item	Level of agreement				
	SA	A	N	D	SD
I normally access ICT resources in UCC IT laboratory:	26.0% (95)	39.1% (143)	10.9% (40)	10.4% (38)	13.7% (50)
The ICT materials or resources (i.e. computers, application software etc.) are enough for effective studies or research	16.7% (61)	30.6% (112)	6.3% (23)	17.2% (63)	29.2% (107)

The finding reveals that ICT resources are mostly accessed by 65.1 % of the students while 10.9% were neutral and 24.1% disagreed. The analysis of the students' opinions on the adequacy of UCC ICT materials or resources (i.e. computers, application software, etc.) for effective studies or research had 47.3% in agreement, 6.3% neutral and 46.4% disagreed. It could be the fact that those who found the IT resources to be inadequate for effective studies and research are the ones that found IT laboratory staff unhelpful in the use of IT resources. Furthermore, other challenges such as an inadequate or insufficient supply of ICT facilities, problems with the internet and unstable power source (Antwi & Frimpong, 2020).

The respondents were asked to indicate the availability of internet resources in UCC IT laboratory, and the information is presented in Figure 5.2.

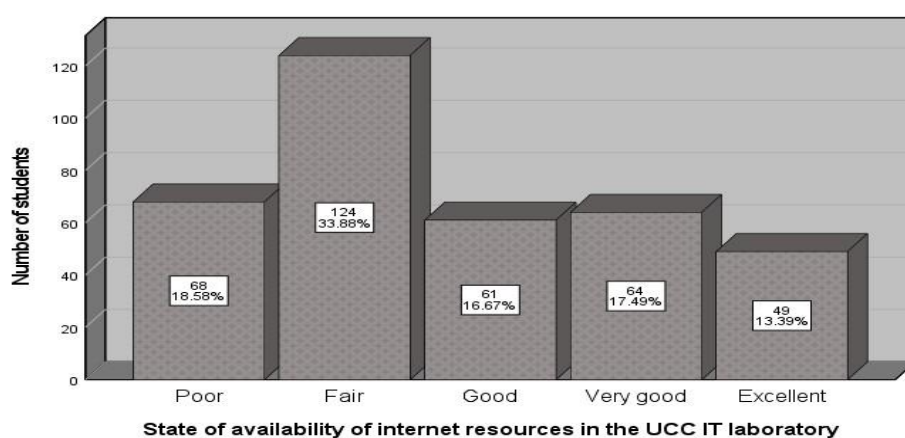


Figure 5.2: State of availability of internet resources

The finding reveals that most of the respondents were of the view that the availability of internet resource in UCC IT laboratory is poor or fair were 18.6% indicating poor and 33.9% indicating fair. Only 30.9% regarded them as very good or excellent.

Figure 5.3 below provides an analysis of how they frequently visit UCC ICT laboratory.

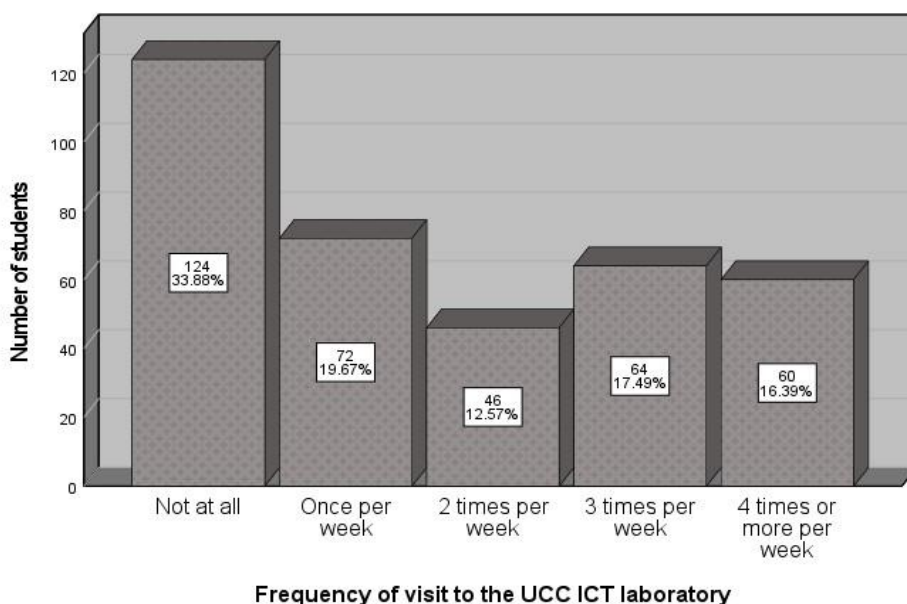


Figure 5.3: Frequency of visit to UCC ICT laboratory

The number of students who at least visit the laboratory three times per week is 17.49%. However, only 33.9% did not visit the laboratory at all. Lack of technological support, insufficient professional growth and training, availability of enough computers and money could be some of the reasons for the aforementioned frequency of the use of the ICT laboratory (Johnson, Jacovina, Russell & Soto, 2016).

The students were asked to indicate the number of hours they normally access the ICT resources per day and the information is presented in Figure 5.4.

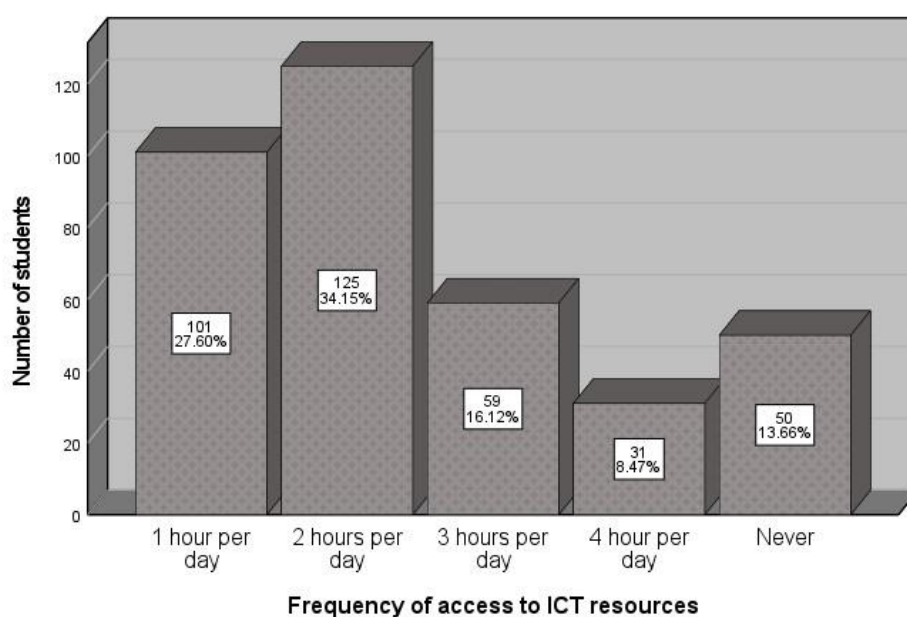


Figure 5.4: Frequency of access to ICT resources

The majority of the students' access ICT resources every day with only 13.7% indicating that they never access ICT resources. About 27.6% indicated that they access for an hour while 34.2% indicated that they access for ICT resources 2 hours per day.

The construct on support services was assessed using 7 items as shown in Table.

Table 5.11: Students' opinions on assistance they receive from the IT laboratory staff

Item	Level of agreement				
	SA	A	N	D	SD
The IT laboratory staff usually assist me in printing of documents	32.2% (118)	46.4% (170)	9.0% (33)	2.5% (9)	9.8% (36)
The IT laboratory staff usually assist me in searching for information on the Internet	35.0% (127)	36.6% (133)	11.6% (42)	2.8% (10)	14.0% (51)
The IT laboratory staff usually assist me in photocopying	29.5% (108)	35.0% (128)	14.8% (54)	7.4% (27)	13.4% (49)

Item	Level of agreement				
	SA	A	N	D	SD
The IT laboratory staff usually assist me to resolve software errors	33.3% (122)	31.1% (114)	12.8% (47)	9.3% (34)	13.4% (49)
The IT laboratory staff usually assist me in downloading information	32.5% (119)	29.5% (108)	12.0% (44)	12.3% (45)	13.7% (50)
The IT laboratory staff usually assist me to rectifying hardware problems	21.0% (77)	39.9% (146)	19.1% (70)	7.7% (28)	12.3% (45)
The IT laboratory staff usually assist to do scanning	16.9% (62)	41.0% (150)	20.2% (74)	8.5% (31)	13.4% (49)

According to Table 5.11, the statement “the IT laboratory staff usually assist me in printing of documents” received 147 (41% of respondents) endorsements. The lowest recorded response for strongly disagreement was by 12.3% (45 respondents) of the students who strongly disagree that IT laboratory staff usually assist them to rectify the hardware problems while 9% (44 respondents) was indecisive about the statement. The statement, “the IT laboratory staff usually assist me in searching for information on the internet” attracted 260 responses (71.6% of respondents). The least response for disagreement with the statement, “the IT laboratory staff usually assist me in searching for information on the internet” was 61 (16.8%) respondents while 11.6% (42 respondents) who were indecisive about the statement.

From Table 5.11, most students (64.5%, 236) agreed to the statement “the IT laboratory staff usually assist me in photocopying”. The table shows that the lowest response for agreement to this statement was by 76 (20.8%) of the respondents. However, a few respondents (14.8, 54 of all respondents) were neutral about the statement. The statement “the IT laboratory staff usually assist me to resolve software errors” had 236 representing 64.4% of the students’ responses for agreement to the statement and 22.7% (83 respondents) of the students for disagreement. About 12.8% (47) were neutral about the statement.

The statement, “the IT laboratory staff usually assist me in downloading information” received 227 endorsements from 62% of respondents. The least response for disagreement was by 26% (95) respondents while 12% (44 respondents) was indecisive about the statement. Most students (60.9%, 223) agreed to the statement, “the IT laboratory staff usually assist me to rectify hardware problems”. The number of disagreements to the statement was 20% (73 respondents) of the students while 19.1% (70 respondents) were indecisive about whether IT laboratory staff usually assist them to rectifying hardware problems or not.

From the table, most students (57.9%, 212) agreed to the statement “the IT laboratory staff usually assist to do scanning”. The table shows that the lowest response for the agreement to this statement was by 80 respondents (21.9% of the respondents). However, only (20.2%, 74 of all respondents) were neutral about the statement.

It can be deduced from data presented in the table that generally students are certain about the IT laboratory staff’s performance of their duties of assisting them (students) in their use of IT resources. This is shown by the significantly high endorsements for those in agreement. Furthermore, this might be so because according to Montoya and Barbosa (2020), the staff found at the various ICT laboratory, whether a librarian or a technician ought to provide the best support for the use of ICT resources.

Table 5.12 below provides an analysis of students’ evaluation of the present status of UCC IT laboratory services: Students’ opinions on the present status of UCC IT laboratory services (n = 366).

Table 5.12: Students’ opinions on assistance they receive from the IT laboratory staff

Efficiency	Frequency	%
Poor	123	33.6%
Good but needs improvement	72	19.7%
Good	28	7.7%
Very good	75	20.5%
Excellent	68	18.6%
	366	100.0%

The range of responses showed that almost a third, 33.6% indicated that students’ opinion on the present status of UCC IT laboratory services were poor while 19.7% chose “good but needs improvement”. This shows that close to 54% seem not to be satisfied by the present status of UCC IT laboratory services. Only 39.1% regarded them as either very good or excellent. Correspondingly, this concurs with the work of Asiyai (2014), which revealed that ICT laboratory ought to be at a unique status to enhance learning.

Figure 5.5 below provides the analysis of students’ opinions about level of accessibility of information in UCC IT laboratory.

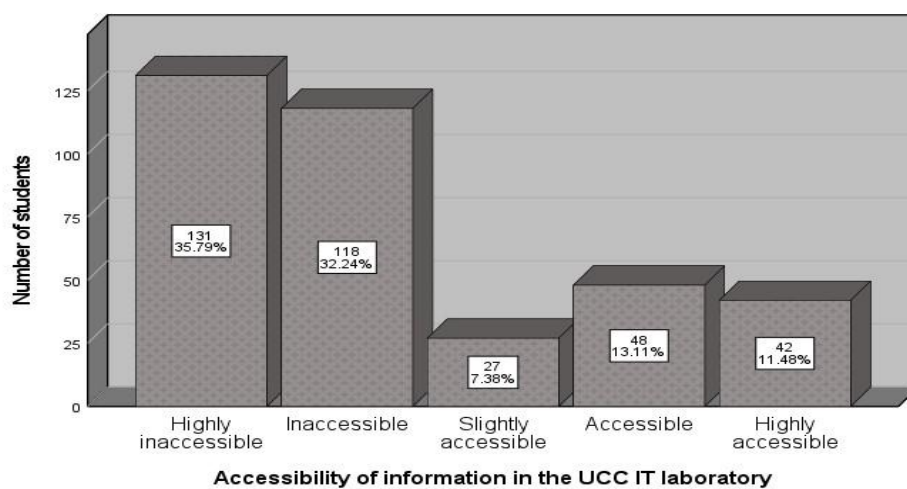


Figure 5.5: Accessibility of information in UCC IT laboratory

The range of responses showed that the majority of the respondents were indicating that they were not accessible with 35.8% saying that they were highly inaccessible while 32.2% said that they are inaccessible and 7.4% said slightly accessible. 25.6% of the respondents indicated that information in UCC IT laboratory accessible constituted 25.6%. From the findings, it could be said that information is not accessible to students in UCC IT laboratory. The finding agrees with the stand of Kaniki (2004:83), who found that students have needs that are common to them.

Table 5.13 below provides the analysis of students’ opinions on whether they access the study materials, (i.e. textbooks, journals and other documents) for information in UCC library and whether they are effective.

Table 5.13: Student's opinion on study material

Item	Level of agreement				
	SA	A	N	D	SD
I normally access study materials (i.e. textbooks, journals and other documents) for information in UCC library	24.0% (88)	49.2% (180)	11.2% (41)	7.7% (28)	7.9% (29)
The study materials in UCC library are enough for effective studies or research	18.0% (66)	42.1% (154)	16.1% (59)	14.8% (54)	9.0% (33)

The range of responses illustrated shows the item “I normally access study materials (i.e. textbooks, journals and other documents) for information in UCC library” had 268 respondents agreeing (73.2% of all respondents) while 41 (11.2% of all respondents) were neutral and 57 (15.6%) disagreed. Generally, most students access the study materials for information from UCC library. In terms of the adequacy of the material, about 60.1% (220) agreed, 16.1% (59) were neutral and 23.8% (97) disagreed. This finding suggests that the study materials for information from UCC library are enough for effective studies or research. The findings agree with the study by Vickery and Vickery (2005:17), which showed that a person (student) with cherished needs will want different categories of general material or information to satisfy his / her desire for knowledge.

Figure 5.6 below provides the analysis of students' opinions on the general level of availability of ICT resources.

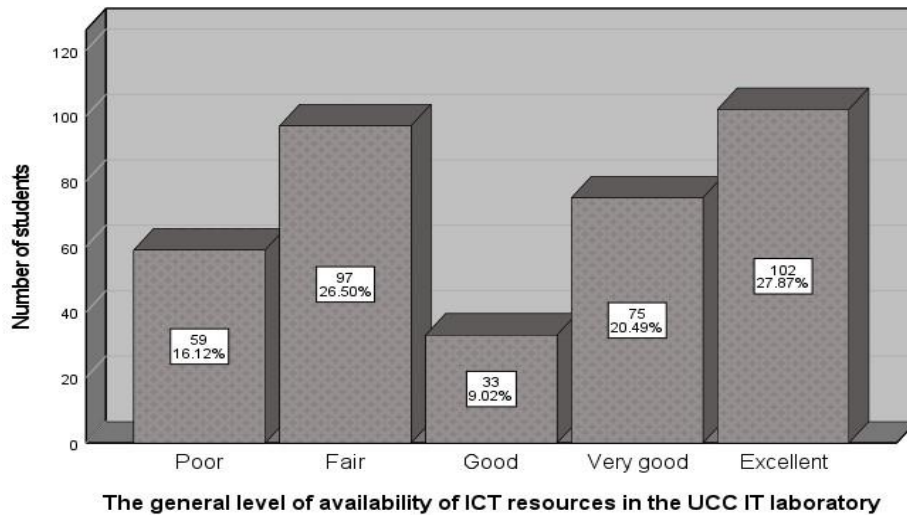


Figure 5.6: General level of availability of ICT resources

Looking at the range of responses illustrated by Figure 5.6, close to 50% indicated that the level of availability of ICT resources was either very good or excellent while 42.6% indicated that there were either poor or fair. Conclusion drawn is that generally level of availability is at least good. The finding concurs with the work of Siddiquah and Salim (2017), who stated that the adequate amount and availability of ICT resources is essential in providing innovative and creative educational resources as well as helping student management of information.

Figure 5.7 the level of frequency in visiting the UCC library.

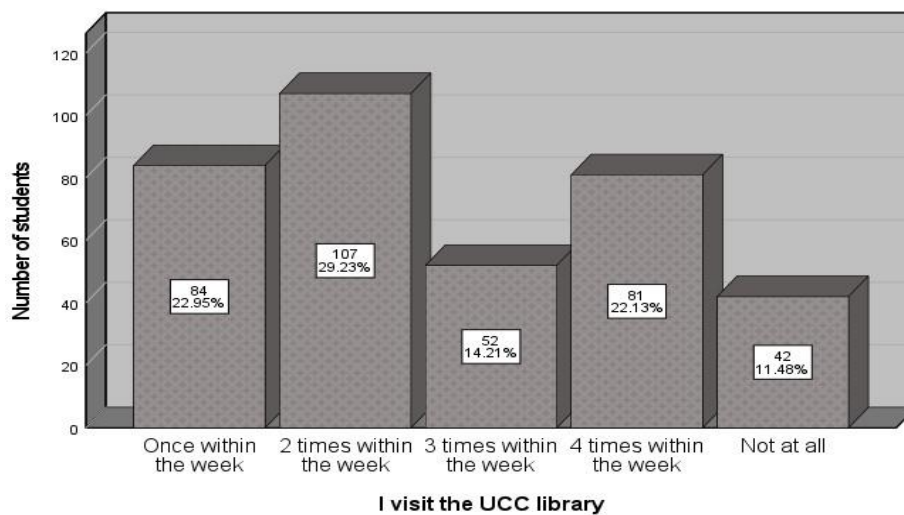


Figure 5.7: Visit to the UCC library

It can be noted that only 11.5% do not visit the UCC library at all per week. At least 35% of the students visit the UCC library at least 3 times per week. The finding suggests that the majority of

the students visited the UCC library on an average of 2 times a week. According to Schwitzer, Moss, Pribesh, John, Burnett, Thompson and Foss (2018:6), students normally visit the institution as a resource centre for numerous reasons such as personal or academic purposes. Students visit the library to get significant, useful and current information in either print or non-print forms for effective research and learning (Hussani, Vashistha & Jimah, 2018). According to Munshi (2016), in Dehli students visit the library to look for information to inform them of current developments. This agrees with Al-Muomen, Morris and Maynard's (2012) finding which reported that lots of students visit the library to search for information for the completion of course work, assignments and term papers.

Figure 5.8 below provides the analysis of students' opinions on how much time they normally spend accessing books in the UCC library.

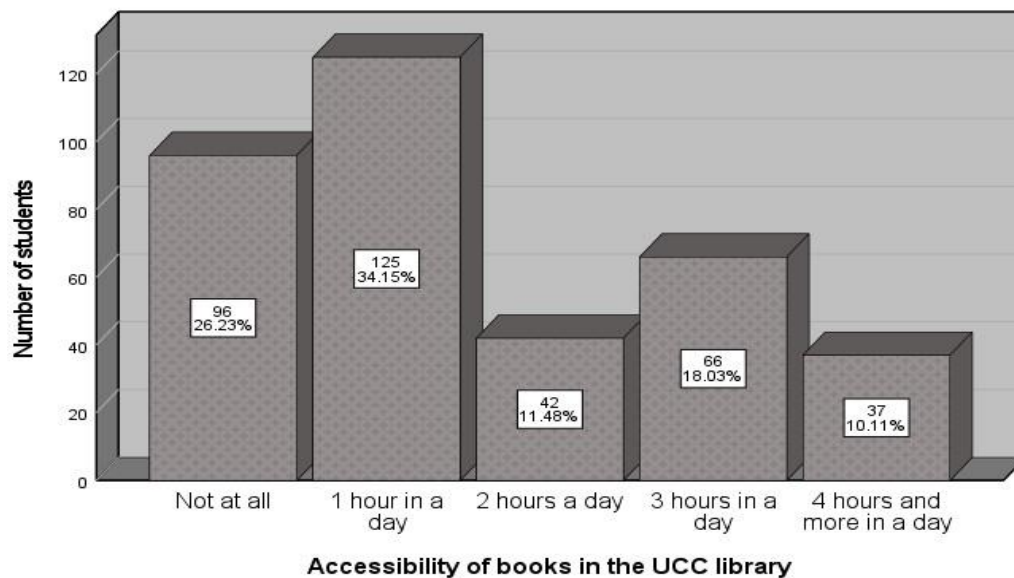


Figure 5.8: Accessibility of books in the UCC Library

Close to 30%, that is, 26.2% indicated that they do not access books in the UCC library at all. The highest proportion of 34.2% indicated that they access books in the library 1 hour per day, while 11.5% access for 2 hours and 18% access for 3 hours per day. On the average majority respondents access books in the UCC library an hour per day. This is in line with Munshi (2016), finding that some students in Dehli University visited the library daily.

Tables 5.14 below provides an analysis of students' evaluation of UCC library staffs' performance with respect to the assistance they give students in the usage of various library resources.

Table 5.14: Students' opinions on assistance from library staff

Item	Level of agreement				
	SA	A	N	D	SD
The IT laboratory staff usually assist me: in the use of reference books	37.4% (137)	41.5% (152)	5.2% (19)	6.3% (23)	9.6% (35)
The IT laboratory staff usually assist me: searching for bibliographies	32.5% (119)	39.3% (144)	11.2% (41)	8.5% (31)	8.5% (31)
The IT laboratory staff usually assist me: in locating textbooks and other documents	21.6% (79)	42.3% (155)	18.3% (67)	7.4% (27)	10.4% (38)
The IT laboratory staff usually assist me: in accessing UCC database	28.1% (103)	35.8% (131)	17.8% (65)	7.4% (27)	10.9% (40)
The IT laboratory staff usually assist me: in searching for information in newspapers	34.3% (124)	28.8% (104)	13.0% (47)	13.0% (47)	10.8% (39)
The IT laboratory staff usually assist me: in the usage of manual catalogues	26.5% (97)	33.6% (123)	20.5% (75)	9.6% (35)	9.8% (36)

According to the table, most students (78.9%, 289) agreed to the statement “the library staff usually assist me in the use of reference books” while 15.9% (58) disagreed to this statement while 5.2% (19) of all respondents) were neutral about the statement. The statement, “the library staff usually assist me in searching for bibliographies” received 263 (71.8% of respondents) endorsements. The proportion for disagreement was by 17% (62 respondents) of the students while 11.2% (41 respondents) were indecisive about the statement.

Most students (63.9, 234) agreed to the statement “the library staff usually assist me in locating textbooks and other documents”. The least response for disagreement was by 17.8% (65 respondents) of the students while 18.3% (67 respondents) were indecisive about the statement.

The statement “the library staff usually assist me in accessing UCC database” received 234 (63.9% of respondents) endorsements. The proportion for disagreement was by 18.3% (67 respondents) of the students while 17.8% (65 respondents) were indecisive about the statement.

The range of responses illustrated by table 5.14 shows highest that the response for agreement to the statement “the library staff usually assist me in searching for information in newspapers” by 63.1% (228 respondents) of the students and for disagreement by 23.8% (86 respondents) of the students. However, only 13% (47) were neutral about the statement. The statement “the library staff usually assist me in the usage of manual catalogues” received 220 endorsements from 60.1% of the respondents and for disagreement by 71 respondents (19.4% of the students) while 20.5% (75) of the respondents were neutral.

Generally, it can be deduced from data presented in the table that the library staff perform their duties of assisting students well as relatively very higher frequencies of opinions agreeing to the statement. The finding confirms Kiriri’s (2019) study, which indicates that more than 75% of users of library viewed library staff positively. This evidently shows that personalised attention from library staff is very vital to the users as well as their users’ cognitive idea of the library in general. Table.15 below provides the analysis of students’ opinions on the present status of the UCC library services.

Table 5.15: Student’s opinion on present status of the UCC library services (n = 366)

Status	Frequency	%
Poor	53	14.5%
Good but needs improvement	77	21.0%
Good	39	10.7%
Very good	104	28.4%
Excellent	93	25.4%
	366	100.0%

The range of responses illustrated by Table 5.15 shows that most students indicated that the present status of the UCC library services is at least good with 10.7% indicating that it was good, 28.4% very good and 25.4% indicated that it was excellent. About 21% indicated that it is good but needs improvement. Observably, the trend seen in the table shows that relatively most students agree

that the present status of the UCC library services is good. This is consistent with the findings of Fagan (2003), who examined student perception of academic libraries and revealed that the majority of students (51%) have positive opinions on the state of the school library.

Figure 5.9 below provides the analysis of students' opinions on general accessibility of the UCC library services.

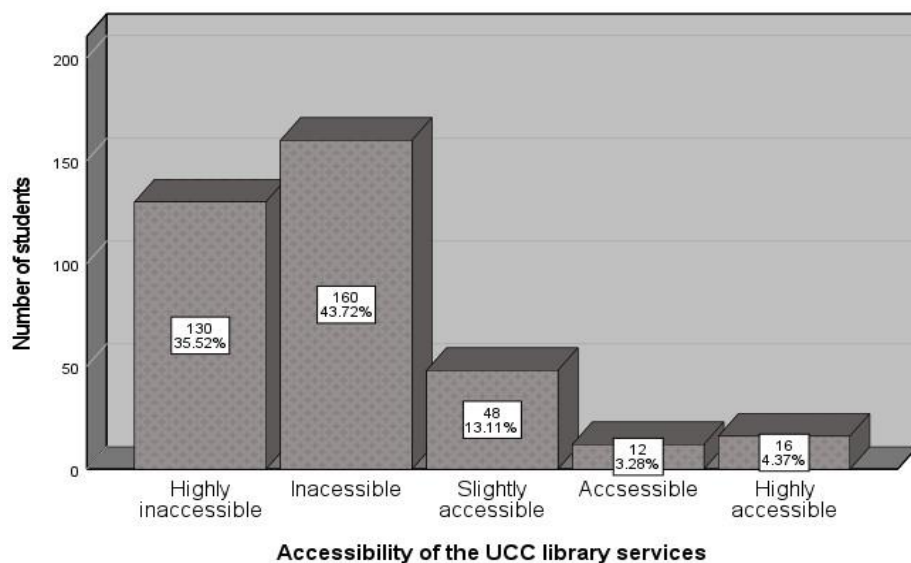


Figure 5.9: Accessibility of the UCC Library services

The range of responses illustrated by Figure 5.9 shows that the majority of the students indicated that generally the UCC library services are highly accessible (35.5%) or inaccessible (43.7%). This somehow agrees with the finding in Table 5.3 which indicated that students overly rely on collegial discussions than library resources.

Table 5.16 below provides the analysis of students' opinions about the impact of ICT in the university their search for information.

Table 5.16: Student's opinion on positive impact of ICT in the university (n = 366)

Impact	Frequency	%
Strongly disagree	16	4.4%
Disagree	7	1.9%
Neutral	70	19.1%

Impact	Frequency	%
Agree	78	21.3%
Strongly agree	195	53.3%
	366	100.0%

The range of responses illustrated by Table 5.16 shows the highest response agree by 74.6% with 53.3% strongly agreeing that the ICT has impact on the university. The results reveal that most of the students agree that the introduction of ICT in the university impacted positively on their information-seeking behaviour. Akinde and Adetimirin (2017) revealed similar findings after studying undergraduate students in Nigeria. Akinde and Adetimirin (2017) reported that students had a positive perception on how effective ICT in improving teaching and learning.

There were seven items that access the problems in usage of ICT resources and results are shown in Table 5.17.

Table 5.17: Students' opinions on problems in usage of ICT resources

Item	Level of agreement				
	SA	A	N	D	SD
Lack of required IT resource(s) (computer hardware and software, accessories, etc)	24.9% (91)	48.1% (176)	13.9% (51)	7.1% (26)	6.0% (22)
Lack of training/help in using IT resources	19.4% (71)	51.9% (190)	14.8% (54)	7.4% (27)	6.6% (24)
Lack of time for searching for information	26.8% (98)	44.3% (162)	14.8% (54)	10.1% (37)	4.1% (15)
Inadequacy of support network	28.1% (103)	41.3% (151)	10.4% (38)	9.0% (33)	11.2% (41)
Unstable power supply	25.4% (93)	35.8% (131)	16.7% (61)	13.1% (48)	9.0% (33)

Item	Level of agreement				
	SA	A	N	D	SD
UCC IT laboratory staff are not friendly	21.6% (79)	32.0% (117)	18.3% (67)	10.4% (38)	17.8% (65)
UCC IT laboratory is not spacious enough	20.2% (74)	31.7% (116)	12.3% (45)	17.8% (65)	18.0% (66)

Table 5.17 shows that 73% agreed that they the IT lab lacked the required IT resource(s) (computer hardware and software, accessories while 13.9% were neutral and only 13.1% disagreed. In terms of the issue about lack of training/help in using IT resources, 71.3% agreed, while 14.8% were neutral and 14% disagreed. About 71.1% agreed that the “lack of time for searching for information” was one of the problems encountered by students in the use of IT resources in the UCC IT laboratory while 14.8% were neutral and 14.2% disagreed.

Table 5.17 shows the highest response for students agreeing that inadequacy of support network was a problem encountered were 254 (69.4% of all respondents) while 10.4% were neutral and 20.2% disagreed. The item “unstable power supply) was regarded as a problem by 224 respondents (61.2% of the respondents), 16.7% were neutral and 22.1% disagreed.

The extent of the unfriendliness of the UCC IT laboratory staff as a problem encountered by students in the use of IT resources in the UCC IT laboratory was confirmed by 53.6% of the students while 18.3% were neutral and 28.2% disagreed while the analysis of students’ opinions on “UCC IT laboratory is not spacious enough” as the a problem encountered by students in the use of IT resources in the UCC IT laboratory was agreed by 190 (51.9% of the respondents), 12.3% were neutral while 35.8% disagreed. Similar challenges of ICT use in university libraries were outlined by Igbo and Imo (2017), who state that unreliable power supply, lack of adequate training for students on how to use ICT’s and slow internet connections are major problems for ICT use in school.

The students were asked to indicate whether seven items were problems in the usage of library resources and the information is presented in Table 5.18.

Table 5.18: Students' opinions on problems in usage of library resources

Item	Level of agreement				
	SA	A	N	D	SD
Lack of time for searching for information	16.9% (62)	48.6% (178)	18.0% (66)	8.2% (30)	8.2% (30)
Required informative materials are not available	19.9% (73)	42.6% (156)	14.8% (54)	13.4% (49)	9.3% (34)
Unstable power supply	26.5% (97)	33.6% (123)	16.4% (60)	10.4% (38)	13.1% (48)
Current library services are not adequate for enhancing sound learning	26.0% (95)	30.3% (111)	20.8% (76)	14.5% (53)	8.5% (31)
Lack of training/ help in using library resources	19.1% (70)	32.2% (118)	19.4% (71)	14.8% (54)	14.5% (53)
Library is not spacious enough to enhance learning	13.7% (50)	33.3% (122)	21.6% (79)	4.9% (18)	26.5% (97)

Table 5.18 shows the highest responses for lack of time for searching for information overall agreement totalling items related to 240 (65.5% of all respondents); 60 disagreed (16.4% of the respondents) and 66 (18%) were neutral about lack of time for searching for information. Thus, largely, responses from students endorsed “lack of time for searching for information” as problematic in their use of the UCC library. About 229 (62.5% of the respondents) agreed that the “unavailability of required informative materials” were problematic in their use of the UCC library with 54 (14.8% of the respondents) neutral and 83 (22.7%) disagreeing. Largely, the finding suggests that there exists a problem of unstable power supply facing students in the use of the UCC library with 220 (60.1% of the respondents) agreeing, 60 (16.4% of the respondents) neutral and 86 (23.5% of the respondents) in disagreement.

The highest responses, that is, 206 (56.3% of the respondents) agreed that the current library services were not adequate for enhancing sound learning while 76 (20.8% of the respondents) were neutral and 84% (23% of the respondents) disagreed. In general, the finding depicts that the current library services are not adequate for enhancing sound learning. About 51.3% agreed that

there was a lack of training/ help in using library resources while 19.4% were neutral and 29.3% disagreed. Generally, the findings suggest that most students were of the opinion that they face a problem related to the lack of training/ help in using library resources.

The range of responses illustrated by Table 5.18 shows that 172 (47% of the respondents) agreed that the library is not spacious enough to enhance learning, with 21.6% neutral and 31.4% in disagreement. In general, the finding depicts that there is mixed feeling with regards to whether the library is spacious to enhance learning. These results concur with the findings revealed by Alphonce and Mwantimwa (2019), who also reported that challenges associated with the use of library resources included the lack of training to use the library resources, lack of informative materials and inadequate library services to meet the needs of students.

5.4.4 Strategies for satisfying information needs and seeking behaviour of the undergraduate students at UCC to promote sound learning and research work

Table 5.19 showed that there were nine items measuring the possible solution in use of library and ICT resources.

Table 5.19: Students’ opinions on strategic solutions on library and ICT resources to promote sound learning

Item	Level of agreement				
	SA	A	N	D	S
Monitoring and maintenance of ICT resources by ICT management	33.3% (122)	48.9% (179)	11.2% (41)	4.6% (17)	1.9% (7)
Continuous and periodic training of students on computer/ICT skills	33.1% (121)	46.7% (171)	10.7% (39)	5.5% (20)	4.1% (15)
Good relationship between UCC library staff and education students	32.8% (120)	45.4% (166)	13.9% (51)	3.6% (13)	4.4% (16)

Item	Level of agreement				
	SA	A	N	D	S
Adequate funding of ICT projects at UCC library and IT lab	35.2% (129)	39.6% (145)	16.9% (62)	8.2% (30)	-
Good relationship between UCC IT laboratory staff and education students	26.0% (95)	47.8% (175)	14.5% (53)	10.9% (40)	.8% (3)
More technical assistance needed by students from IT officers in charge of IT laboratory	24.3% (89)	48.9% (179)	19.9% (73)	5.2% (19)	1.6% (6)
The UCC library space should be enlarged as well as automated to enhance information-search methods	22.1% (81)	50.5% (185)	20.8% (76)	6.6% (24)	-
The IT laboratory space should be enlarged and supplied with more IT resources to promote high accessibility of IT resources	24.6% (90)	47.0% (172)	18.9% (69)	8.2% (30)	1.4% (5)
Procurement of generator to supplement electricity supply	35.8% (131)	35.2% (129)	21.6% (79)	3.3% (12)	4.1% (15)

In Table 5.19, the range of responses is highest for students who agreed (82.2%, 301) that monitoring and maintenance of ICT resources by ICT management as a possible solution' while 11.2% were neutral and only 6.5% disagreed. This suggests the most agreed solution to the problems faced in the use of the UCC ICT and library resources as indicated by the students. The other suggested solution which recorded a significant number of endorsements from the respondents were: "continuous and periodic training of students on computer/ICT skills" as a solution to problems faced in the use of the UCC ICT and library resources (79.8%, 292 of respondents), "good relationship between the UCC library staff and education students" (78.2%, 286 of respondents), "adequate funding of ICT projects in the UCC library and IT lab" (74.8%, 274 of respondents), "good relationship between the UCC IT laboratory staff and education students" (73.8%, 270 of respondents), "more technical assistance needed by students from IT

officers in charge of IT laboratory” (73.2%, 268 of respondents), “the UCC library space should be enlarged as well as automated to enhance information-search methods” (72.6%, 266 of respondents), “the IT laboratory space should be enlarged and supplied with more IT resources to promote high accessibility of IT resources” (71.6%, 262 of respondents) and “procurement of generator to supplement electricity supply” (71%, 260 of respondents). From the findings, monitoring and maintenance of ICT resources, and continuous and periodic training of students on computer/ICT skills could be considered solutions to problems faced in the use of UCC ICT and library resources due to their receipt of most of the commendations. The work of Khan (2016) also agrees that providing more library resources, training for students on how to use library resources and improving technical assistance for students are among the vital procedures to enhance easy use of library resources.

5.5 Exploratory factor analysis

Exploratory factor analysis using principal components analysis with a varimax rotation was used to reduce the data to a small set of variables with items that are highly correlated within constructs. The aim was to determine whether the items in the constructs which are used pertaining to usage of ICT resources (11 items), ICT support services (7 items), usage of library resources (6 items) and ICT software (7 items), computer skills of students (17 items) and information-seeking behaviour (3 items), problems in usage of ICT resources (7 items), problems in usage of library resources (7 items) and possible solutions in use of library and ICT resources (9 items) were highly correlated in order to form summated scores. Three exploratory factor analysis were done, one for the independent variables (usage of ICT resources, ICT support services, usage of library resources, ICT software) and one for the dependent variables (computer skills of students, information-seeking behaviour) and the last one was for the strategic variables to be used in making some of the recommendations (problems in usage of ICT resources, problems in usage of library resources and possible solutions in use of library and ICT resources). The aim was to be able to use the items that were highly correlated to form summated scores that could be used to determine whether gender, age and level of study had an effect on the opinion of students on issues on information needs and seeking behaviour. Black and Babin (2019), indicated that exploratory factor analysis provides the empirical basis for assessing the structure of variables and the potential for creating these composite measures or selecting a subset of representative variables for further analysis. The authors further indicated that principal component analysis method is used when the main purpose is data reduction.

According to Hair et al. (2019), to conduct exploratory factor analysis, the following conditions should be met:

Sample size should be preferably larger than 100 in this case it was 366.

- The majority of the communalities that helps in identifying the strength of the factors in explaining each variable and the majority of the factor analysis should be greater than .6.
- For factor analysis to be adequate the Kaiser- Meyer-Olkin (KMO) measure of sampling adequacy should be greater than .5.
- Bartlett's Test of Sphericity should be significant with p-values less than .05 for the correlations among the variables to be sufficient for performing factor analysis.
- For practical significance, the factor loadings should be above $\pm .5$.
- The latent root criterion to be used to retain factors with eigenvalues greater than 1. It is one of the stopping rules used to determine the number of factors to retain.
- Robustness of the solution is achieved if the factor solution explains at least 60% of the total variation.

The factor solutions are discussed in the following subsections.

5.5.1 Exploratory factor analysis of the independent variables

The exploratory factor analysis was done on the constructs, usage of ICT resources (11 items), ICT support services (7 items), usage of library resources (6 items) and ICT software (7 items) and thus initially there were 31 items. Out of the 31 items, 8 (5 from usage of ICT resources, 2 from ICT support services and 1 from ICT software) were dropped from the analysis resulting in 23 items remaining which are usage of ICT resources (6 items), ICT software (5 items), ICT support services (6 items) and usage of library resources (6 items), The items dropped were due to insignificant factor loadings as well as due to cross loading on two factors. Details of the particular items dropped can be noticed from the detailed questionnaire at the appendix.

5.5.1.1 Kaiser-Meyer-Olkin test and Bartlett's test of sphericity

The Kaiser- Meyer-Olkin (KMO) measure of sampling adequacy was used to determine the adequacy of data for factor analysis and the Bartlett's Test of Sphericity to determine whether the correlations among the variables were sufficient. The Kaiser- Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity to determine the appropriateness of the factor solution is shown in Table 5.20.

Table 5.20: KMO and Bartlett's Test of Sphericity for independent constructs

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.769
Bartlett's Test of Sphericity	Approx. Chi-Square	4928.336
	Df	253
	Sig.	$p < .001$

The KMO measure of sampling adequacy was .769 satisfying the adequacy of factor analysis since it is greater than .5 (Dixon & Woolner, 2012). The Bartlett's test of Sphericity resulted in a chi-square value of 4928.336 with 253 degrees of freedom and a p-value of less than .001 which was significant since it is less than .05 (Dixon & Woolner, 2012). The two results show that the data was appropriate for factor analysis since it satisfied both tests.

5.5.1.2 Extraction of factors and the factor solution

The eigenvalues, percentage of variance and cumulative percentage of variance are shown in Table 5.21.

Table 5.21: Rotated sums of squared loadings for the independent constructs

Factor	Eigenvalues	% of Variance	Cumulative %
1	6.849	29.778	29.778
2	2.521	10.960	40.738
3	2.274	9.889	50.627
4	1.845	8.023	58.650
5	1.614	7.017	65.667
6	1.078	4.686	70.352

The principal component analysis using the varimax rotation with Kaiser Normalisation resulted in the extraction of six factors and the factor solution was robust since it explained 70.4% of the total variance (Dixon & Woolner, 2012). The items with factor loadings greater than .5 were retained for practical significance and the factor solution is shown in Table 5.22.

Table 5.22: Rotated factor solution for the independent constructs

Item	Component					
	1	2	3	4	5	6
ICTSS4. The IT laboratory staff usually assist me: in the use of reference books	.885					
ICTSS3. The IT laboratory staff usually assist me: searching for bibliographies	.861					
ICTSS2. The IT laboratory staff usually assist me: in locating textbooks and other documents	.854					
ICTSS5. The IT laboratory staff usually assist me: in accessing UCC database	.753					
ICTSS6. The IT laboratory staff usually assist me: in searching for information in newspapers	.746					
ICTSS1. The IT laboratory staff usually assist me: in the usage of manual catalogues	.652					
SS3. In printing of documents		.856				
SS1. Resolving software errors		.764				
SS2. Rectifying hardware problems		.724				
SS4. Scanning		.691				
SS6. Photocopying		.650				
SS5. Downloading information		.646				
MSIF10. I normally listen to the radio in my search for information			.782			

Item	Component					
	1	2	3	4	5	6
MSIF9. I normally use printers			.769			
	Component					
	1	2	3	4	5	6
MSIF8. I normally use scanners in my search for information			.733			
MSIF2. I normally browse the internet in my search for information				.843		
MSIF1. I normally use computers in my search for information				.736		
MSIF3. I normally access my e-mail in my search for information				.609		
UAS2. Spread sheet					.894	
USA3. Data base management system					.707	
USA4. Desktop publishing					.595	
USA5. Presentation software, e.g. Power Point						.784
USA7. Internet						.614

The items of the same construct constituted the members in a factor. The first factor had an eigenvalue of 6.849 and explained 29.8% of the total variation. All items on the construct usage of library resources loaded on this factor. “ICTSS2” which is *the IT laboratory staff usually assist me: in locating textbooks and other documents* had a loading of .854. The items “ICTSS4 *the IT laboratory staff usually assist me: in the use of reference books*” and “ICTSS3. *The IT laboratory staff usually assist me: searching for bibliographies*” had factor loadings of .861 and .885 respectively.

The second factor had the remaining items on ICT support services. The eigenvalue was 2.521 and it explained 11% of the total variation. The items “*SS3. In printing of documents*” and “*SS1. Resolving software errors*” were loading highly on the factor with factor loadings of .856 and .764 respectively.

The construct on usage of ICT resources was divided into two factors which were the third factor and fourth factor respectively. The third factor had an eigenvalue of 2.274 and explained 9.9% of the total variation and the fourth factor had an eigen value of 1.845 and explained 8% of the total variation. All in all, the construct usage of ICT resources explained 17.9% of the total variation. The third factor had the items “*MSIF10. I normally listen to the radio in my search for information*” and “*MSIF9. I normally use printers*” loading highly on the factor with factor loadings of .782 and .769 respectively. The fourth factor had items “*MSIF2. I normally browse the internet in my search for information*” and “*MSIF1. I normally use computers in my search for information*” loading highly on the factor with factor loadings of .843 and .736 respectively. The results show that usage of ICT resources items can be grouped into two sub-components.

The construct ICT software was subdivided into two factors which were the fourth and fifth factors. The fourth factor had an eigenvalue of 1.614 and explained 7% of the total variation while the fifth factor had an eigenvalue of 1.078 and explained 4.7% of the total variation all in all the construct on ICT software explained 11.7% of the total variation. The fifth factor had the items “*UAS2. Spread sheet*” and “*UAS3. Data base management system*” loading highly on the factor with factor loadings of .843 and .736 respectively. The sixth factor had items “*UAS5. Presentation software, e.g. Power Point*” and “*UAS7. Internet*” loading highly on the factor with factor loadings of .784 and .614 respectively. The results show that ICT software items can be grouped into two sub-components.

The six-factor solution was robust since it explained total variance explained 70.4% of the total variation which is above 60% the rule of thumb proposed by Hair Jr et al., (2020).

5.5.2 Exploratory factor analysis of the dependent variables

The exploratory factor analysis was done on the constructs, computer skills of students (17 items) and information-seeking behaviour (3 items) and thus initially there were 20 items. Out of the 20 items, 7 (6 from computer skills of students and 1 from information-seeking behaviour) items were dropped from the analysis resulting in 13 items remaining where computer skills of students (11

items) and information-seeking behaviour (2 items). The 7 items dropped were due to insignificant factor loadings below .5 or were cross loadings on two factors. Details of the particular items dropped can be noticed from the detailed questionnaire in Appendix 8.

5.5.2.1 Kaiser-Meyer-Olkin test and Bartlett’s test of sphericity

The Kaiser- Meyer-Olkin (KMO) measure of sampling adequacy was used to determine the adequacy of data for factor analysis and the Bartlett's Test of Sphericity to determine whether the correlations among the variables were sufficient. The Kaiser- Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity to determine the adequacy and sufficiency of the factor solution are shown in Table 5.23.

Table 5.23: KMO and Bartlett’s Test of Sphericity for the dependent constructs

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.656
Bartlett's Test of Sphericity	Approx. Chi-Square	1884.471
	Df	78
	Sig.	$p < .001$

The analysis resulted in a KMO measure of sampling adequacy of .656 and the Bartlett’s test of Sphericity with a chi-square value of 1884.471 with 78 degrees of freedom and a p-value of less than .001 which was significant since it is less than .05. Since the KMO was greater than .05 and the Bartlett’s Test of Sphericity was significant the two results show that the data was appropriate for factor analysis.

5.5.2.2 Extraction of factors and the factor solution for the dependent constructs

The eigenvalues, percentage of variance and cumulative percentage of variance are shown in Table 5.24.

Table 5.24: Rotated sums of squared loadings for the dependent constructs

Factor	Eigenvalues	% of Variance	Cumulative %
1	3.760	28.921	28.921
2	1.857	14.286	43.207
3	1.792	13.782	56.989

Factor	Eigenvalues	% of Variance	Cumulative %
4	1.251	9.625	66.614
5	1.041	8.007	74.621

The principal component analysis using the varimax rotation with Kaiser Normalisation resulted in the extraction of five factors and the factor solution was robust since it explained 74.6% of the total variance. The items with factor loadings greater than .5 were retained for practical significance and the factor solution is shown in Table 5.25.

Table 5.25: Rotated factor solution for the dependent constructs

Item	Component				
	1	2	3	4	5
CS16. I can save work from computer to pen drive	.910				
CS17. I can save work from pen drive to computer	.894				
CS15. I can double click a mouse button	.704				
CS1. I am very good at typing		.835			
CS3. I normally use all the keys on the computer keyboard		.774			
CS2. I can browse very well		.705			
CS7. I am able to restore a window from a task bar			.866		
CS6. I am able to minimize a window from a task bar			.802		
CS8. I am able to name work on hard drive before saving.				.835	

Item	Component				
	1	2	3	4	5
CS10. I am able to save work in appropriate named file				.747	
CS9. I am able to save work on hard drive.				.596	
PESQE3. Studying information on subject from the internet					.888
PESQE2. Studying information on subject from library materials					.867

The construct on computer skills of students was divided into four factors. The first factor had an eigenvalue of 3.760 and explained 28.9% of the total variation, the second factor had an eigenvalue of 1.857 and explained 14.3% of the total variation while the third factor had an eigenvalue of 1.792 and explained 13.8% of the total variation and the fourth factor had an eigenvalue of 1.251 and explained 9.6% of the total variation. All in all, the construct computer skills of students explained 66.6% of the total variation. The items “*CS16. I can save work from computer to pen drive*” and “*CS17. I can save work from pen drive to computer*” were loading highly on the factor with factor loadings of .910 and .894 respectively. The second factor had the items “*CS1. I am very good at typing*” and “*CS3. I normally use all the keys on the computer keyboard*” loading highly on it with factor loadings of .835 and .7774 respectively. The third factor had items “*CS7. I am able to restore a window from a task bar*” and “*CS6. I am able to minimize a window from a task bar*” loading highly on it with factor loadings of .866 and .802 respectively. The fourth factor had the items “*CS8. I am able to name work on hard drive before saving*” and “*CS10. I am able to save work in appropriate named file*” loading highly on it with factor loadings of .835 and .747 respectively. The results show that the construct on computer skills of students’ items can be grouped into four sub-components.

The fifth factor was all the remaining items on information-seeking behaviour. The eigenvalue was 1.041 and it explained 8% of the total variation. The items “*PESQE3. Studying information on subject from the internet*” and “*PESQE2. Studying information on subject from library materials*” constituted the factor with factor loadings of .888 and .867 respectively.

The five-factor solution was robust since it explained total variance explained 74.6% of the total variation which is above 60% the rule of thumb proposed by Hair Jr et al. (2019).

5.5.3 Exploratory factor analysis of the strategic variables

The exploratory factor analysis was done on the constructs' problems in usage of ICT resources (7 items), problems in usage of library resources (7 items) and possible solutions in use of library and ICT resources (9 items) and thus initially there were 23 items. Out of the 23 items, 7 (5 from problems in the usage of library resources and 2 from possible solutions in use of library and ICT resources) were dropped from the analysis resulting in 16 items remaining which are usage of ICT resources (7 items), problems in usage of library resources (2 items) and possible solutions in use of library and ICT resources (7 items). The items dropped were due to insignificant factor loadings or were cross loading on two factors. Details of the particular items dropped can be noticed from the detailed questionnaire in Appendix 8.

5.5.3.1 Kaizer-Meyer-Olkin test and Bartlett's test of sphericity

The Kaiser- Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity for determining the appropriateness of the factor solution are shown in Table 5.26.

Table 5.26: KMO and Bartlet Test of Sphericity for the strategic constructs

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.708
Bartlett's Test of Sphericity	Approx. Chi-Square	2863.741
	Df	120
	Sig.	<i>p</i> < .001

The KMO measure of sampling adequacy was .708 indicating that factor solution was adequate since it is greater than .5. Bartlett's test of Sphericity resulted in a chi-square value of 2863.741 with 120 degrees of freedom and a p-value of less than .001 which was significant since it is less than .05. The two results show that the data was appropriate for factor analysis since it satisfied both tests.

5.5.3.2 Extraction of factors and the factor solution

The eigenvalues, percentage of variance and cumulative percentage of variance are shown in Table 5.27.

Table 5.27: Rotated sums of squared loadings for the strategic constructs

Factor	Eigenvalues	% of Variance	Cumulative %
1	4.488	28.049	28.049
2	2.589	16.182	44.231
3	2.025	12.654	56.884
4	1.311	8.197	65.081
5	1.121	7.006	72.088

The principal component analysis using the varimax rotation with Kaiser Normalisation resulted in the extraction of five factors and the factor solution was robust since it explained 72.1% of the total variance. The items with factor loadings greater than .5 were retained for practical significance and the factor solution is shown in Table 5.28.

Table 5.28: Rotated factor solution for the strategic constructs

Item	Component				
	1	2	3	4	5
PS6. The UCC library space should be enlarged as well as automated to enhance information-search methods	.804				
PS3. Monitoring and maintenance of ICT resources by ICT management	.719				
PS2. Procurement of generator to supplement electricity supply	.713				
PS1. Continuous and periodic training of students on computer/ICT skills	.704				

Item	Component				
	1	2	3	4	5
PS4. Adequate funding of ICT projects in UCC library and IT lab	.610				
PROICT2. Lack of required IT resource(s) (computer hardware and software, accessories, etc)		.831			
PROICT3. Lack of time for searching for information		.801			
PROICT1. Inadequacy of support network		.784			
PROICT4. Unstable power supply		.703			
PROICT5. Lack of training/help in using IT resources		.579			
PROICT7. UCC IT laboratory is not spacious enough			.886		
PROICT6. UCC IT laboratory staff are not friendly			.879		
PS5. More technical assistance needed by students from IT officers in charge of IT laboratory				.785	
PS7. The IT laboratory space should be enlarged and supplied with more IT resources to promote high accessibility of IT resources				.727	
PROL2. Lack of time for searching for information					.913
PROL3. Current library services are not adequate for enhancing sound learning					.812

The construct on possible solutions for use of library and ICT resources was divided into two factors which were factor 1 and factor 4 respectively. The first factor had an eigen value of 4.488 and explained 28% of the total variation, the second factor in the construct which is the fourth factor in the factor solution had an eigen value of 1.311 and explained 8.2% of the total variation. All in all, the construct on possible solutions for the use of library and ICT resources explained 36.2% of the total variation. The items “PS6. The UCC library space should be enlarged as well as automated to enhance information-search methods” and “PS3. Monitoring and maintenance of ICT resources by ICT management” were loading highly on the factor with factor loadings of

.804 and .719 respectively. The second factor in the construct which is the fourth factor in the factor solution had the items “*PS5. More technical assistance needed by students from IT officers in charge of IT laboratory*” and “*PS7. The IT laboratory space should be enlarged and supplied with more IT resources to promote high accessibility of IT resources*” loading highly on it with factor loadings of .785 and .727 respectively. The results show that the construct on possible solutions in use of library and ICT resources’ items can be grouped into two sub-components. All the items loaded above 0.5 making them valid to be used in the inference analysis.

The construct on problems in usage of ICT resources was divided into two factors which were the second factor and fourth factor respectively. The second factor had an eigen value of 2.589 and explained 16.2% of the total variation and the third factor had an eigen value of 2.025 and explained 12.7% of the total variation. All in all, the construct problems in usage of ICT resources explained 28.9% of the total variation. The second factor had the items “*PROICT2. Lack of required IT resource(s) (computer hardware and software, accessories, etc)*” and “*PROICT3. Lack of time for searching for information*” with factor loadings of .831 and .801 respectively. The third factor had items “*PROICT7. UCC IT laboratory is not spacious enough*” and “*PROICT6. UCC IT laboratory staff are not friendly*” with factor loadings of .886 and .879 respectively. The results show that problems in usage of ICT resources items can be grouped into two sub-components.

The fifth factor was all the remaining items on problems in usage of library resources. The eigenvalue was 1.121 and it explained 7% of the total variation. The items “*PROL2. Lack of time for searching for information*” and “*PROL3. Current library services are not adequate for enhancing sound learning*” constituted the factor with factor loadings of .913 and .812 respectively.

The five-factor solution was robust since it explained total variance explained 72.1% of the total variation which is above the 60% rule of thumb proposed by Hair Jr et al. (2019).

5.6 Descriptive statistics of the constructs

According to Subedi (2016), Likert items can be used to form composite score/variable by summing or averaging items in a construct. The composite variables were constructed by averaging items in a construct and the average was used since it can be linked to the original Likert

scale and thus making interpretation easier. The descriptive statistics of the composite variables are shown in Table 5.29.

Table 5.29: Means and standard deviation for the constructs

Construct	Number of items	Mean	SD	Agreement level
Usage of ICT resources	6	3.54	.59	Agreed
Computer skills of students	11	4.28	.57	Agreed
ICT software	5	3.83	.45	Agreed
Information-seeking behaviour	2	4.40	.64	Agreed
ICT support services	6	3.59	.93	Agreed
Usage of library resources	6	3.68	.79	Agreed
Problems in usage of ICT resources	7	3.57	.75	Agreed
Problems in usage of library resources	2	3.54	.82	Agreed
Possible solution in usage of library and ICT resources	7	3.95	.83	Agreed

The means are explained in relation to the interpretation per items for 1 to 5 scale suggested by Ooko (2016). It was posited that response means above 3.75 indicates that the respondents agree without doubt; between 3.00 and 3.74 indicates that the respondents agree with some doubt; between 2.6 and 2.99 indicates that the respondents agree but have doubt and are not sure; 2.00-2.99 indicates that the respondents disagree with some doubt; and below 2.00 indicates that the respondents disagree with no doubt at all. All the constructs had levels of agreement close to four as per 5 point Likert scale which suggests that indicating that the majority of the respondents on the average agree with some doubt issues on usage of ICT resources, computer skills of students, ICT software, information-seeking behaviour, ICT support services, usage of library resources, problems in usage of ICT resources, problems in usage of library resources and possible solution in usage of library and ICT resources (Ooko, 2016). Specific details of the various construct level of agreement are explained subsequently.

The lowest means were recorded from usage of ICT resources ($M = 3.54$; $SD = .59$) and problems in usage of library resources ($M = 3.54$; $SD = .82$). According to Ooko (2016), it means that the respondents agree with some doubt on the usage of ICT resources and problems in usage of library

resources. The highest mean was information-seeking behaviour ($M = 4.40$; $SD = .64$) which indicates that the respondents explain their information-seeking behaviour without any doubt. The lowest variability was recorded on ICT software and it was .45 while the largest variability was recorded on ICT support services and it was .93. This shows that the opinion on ICT software had values that were close to each other indicating consistency was for ICT support services there was some variation. Using the empirical rule, it can conclude that about 68.26% of the scores in ICT software lie between 3.38 and 4.28 (\pm one standard deviation from the mean). Similarly, for ICT support about 68.26% of the respondents had their response rated between 4.11 and 4.52.

5.7 Comparative analysis using independent t-tests and ANOVA

The independent t-test and one-way analysis of variance (ANOVA) were used to determine if the views on issues on information needs and seeking behaviour differed by social demographic characteristic. This will assist the researcher in making recommendations on identifying ways of improving strategies for satisfying information needs and seeking behaviour of the undergraduate students at UCC to promote sound learning and research work. The assumptions of the independent t-tests and ANOVA are such that the observations should be independent, the data comes from a normally distributed population and that they should be equal variances across the groups, that is, the categories of a variable should have equal variances. The observations were independent since there were randomly selected and the central limit theorem was applied to satisfy the conditions of normality and in this case the sample size of 366 was adequate. On the issue of equal variances, the Levene test of homogeneity of variance was used to test the assumptions. In the case of the independent t-test if the assumption was not met then statistics under equal variances not assumed were used. For one-way analysis of variance (ANOVA), if the assumption was not met, then the Welch robust test of equality of means was used to test for equal means.

For the one-way analysis of variance post-hoc tests were done to determine which groups differed. If the assumption of equal variances was met, then the Tukey HSD test was used as a post hoc test and if the assumption of equal variances was not met the Games-Howell test was used as a post hoc test. The tests were done at the 5% level of significance and will be presented in the next subsections.

5.7.1 Independent t-test for determining difference in mean scores by gender

The Levene's test for equality of variances resulted in all the composite variables having equal variances between males and females except usage of ICT resources (p-value = .047), ICT software (p-value < .001), usage of library resources (p-value = .042) and possible solution in usage of library and ICT resources (p-value <.001). The p-values were less than .05 and statistics under equal variances not assumed were presented for the variables. The independent t-test results are presented in Table 5.30.

Table 5.30: Independent t-test for difference in mean scores by gender

Construct	Group Statistics				Levene's Test			T-test	
	Gender	N	Mean	SD	Equal	F	Sig	t-value	p-value)
Usage of ICT resources	Male	153	3.525	.805	Assumed	3.982	.047	-.420	.674
	Female	213	3.557	.652	Not			-.406	.685
Computer skills of students	Male	153	4.278	.518	Assumed	.529	.467	-.172	.863
	Female	213	4.288	.515	Not			-.172	.864
ICT software	Male	153	3.807	.750	Assumed	13.923	$p < .001$	-.688	.492
	Female	213	3.854	.556	Not			-.656	.512
Information-seeking behaviour	Male	153	4.494	.633	Assumed	1.725	.190	2.295	.022
	Female	213	4.333	.676	Not			2.319	.021
ICT support services	Male	153	3.564	.984	Assumed	.182	.669	-.444	.658
	Female	213	3.610	.976	Not			-.443	.658
Usage of library resources	Male	153	3.855	.941	Assumed	4.168	.042	2.665	.008
	Female	213	3.563	1.098	Not			2.733	.007
Problems in usage of ICT resources	Male	153	3.706	.811	Assumed	.012	.914	2.779	.006
	Female	213	3.469	.801	Not			2.773	.006
Problems in usage of library resources	Male	153	3.719	1.124	Assumed	1.989	.159	2.657	.008
	Female	213	3.418	1.028	Not			2.619	.009
	Male	153	3.972	.757	Assumed	14.481	$p < .001$.514	.608

Construct	Group Statistics				Levene's Test			T-test	
	Gender	N	Mean	SD	Equal	F	Sig	t-value	p-value)
Possible solution in usage of library and ICT resources	Female	213	3.937	.548	Not			.488	.626

The results of the independent t-test reveal that the constructs usage of ICT resources, computer skills of students, ICT software, ICT support services and possible solution in usage of library and ICT resources had equal means indicating that there was no difference in opinion between males and females ($p>0.5$). It can be concluded that gender was not a determining factor on any differences. However, the composite variables information-seeking behaviour, usage of library resources, problems in usage of ICT resources and problems in usage of library resources had mean difference between males and females ($p<0.5$). The student opinion on these issues was affected by whether the student is a male or female and these issues are discussed in detail below.

The results of the independent sample t-tests showed that information-seeking behaviour had significant difference across gender, $t(364) = 2.295$, $p < .022$ where males ($M = 4.49$, $SD = .63$) had a significantly higher mean score than females ($M = 4.33$, $SD = .68$). The magnitude of the difference in the means (mean difference = .16, 95% CI: .02 to .30) was of a small effect ($\eta^2 = .01$). Approximately 1% of the total variation in information-seeking behaviour was accounted for by gender.

The confidence interval error bars are presented in Figure 5.10 below.

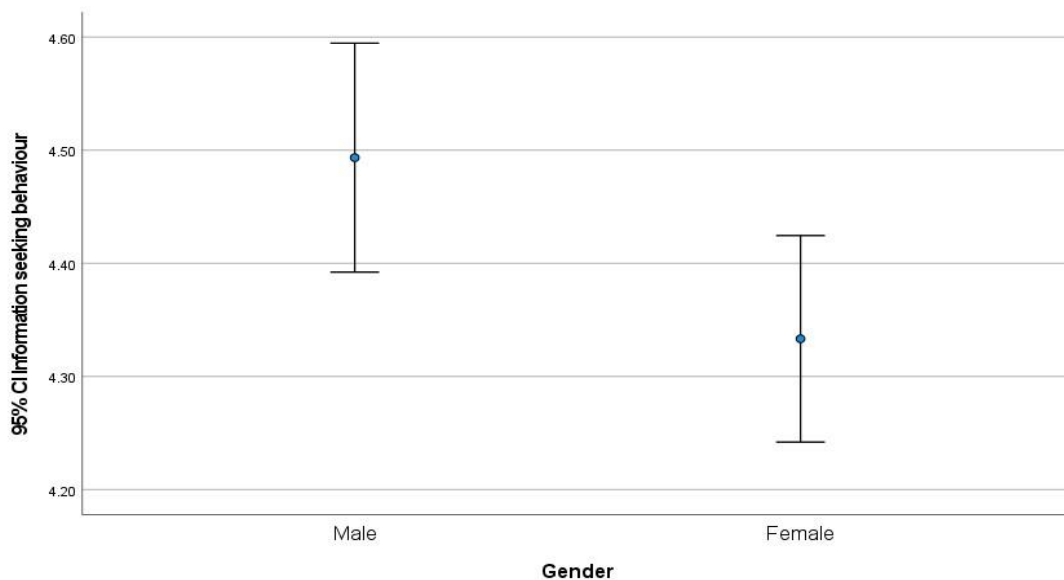


Figure 5.10: Information-seeking behaviour confidence interval error bars by gender

The results suggested that males were more in agreement with issues on information-seeking behaviour than females.

Results from the independent t-test with equal variances not assumed to determine whether males and females differ on usage of library resources showed that the test was statistically significant, $t(352.740) = 2.733$, $p = .007$. The 95% confidence interval for the mean for the usage of library resources mean ranged from .08 to .51. The group means revealed that the mean for males ($M = 3.86$, $SD = .94$) was significantly higher than that of females ($M = 3.56$, $SD = 1.10$). The mean difference was of a small effect size as supported by an $\eta^2 = .02$. Approximately 2% of the total variation in usage of library resources is explained by gender. The confidence interval error bars are presented in Figure 5.11.

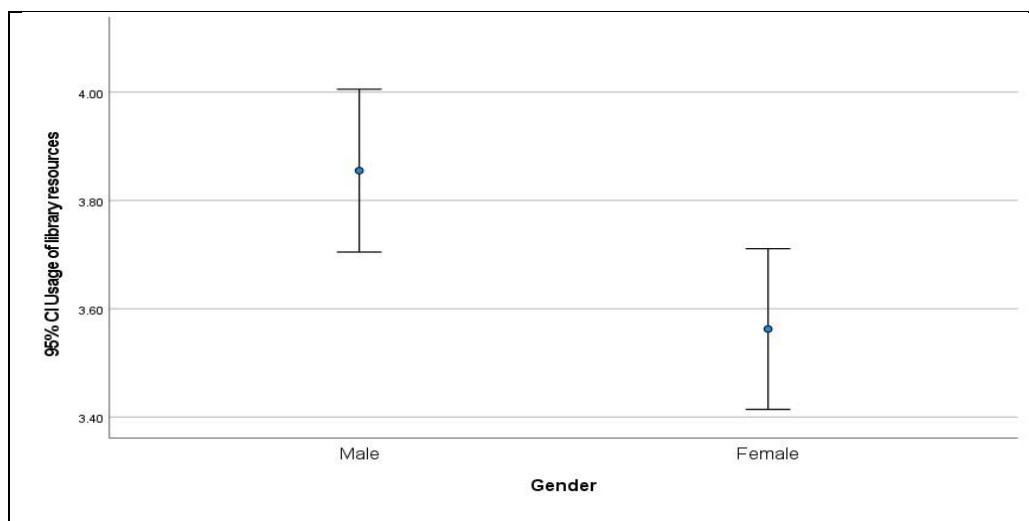


Figure 5.11: Usage of library resources confidence interval error bars by gender

All means were close to four; however, the level of agreement was more for males than females on issues related to the usage of library resources. An independent t-test results for problems in usage of ICT resources has a significant effect across gender, $t(364) = 2.779$, $p = .006$ with males ($M = 3.71$, $SD = .81$) having a significantly higher mean score than females ($M = 3.47$, $SD = .80$). The magnitude of the differences in the means (mean difference = .24, 95% CI: .07 to .40) was of a small effect ($\eta^2 = .03$). Approximately 3% of the total variation in problems in usage of ICT resources was explained by gender.

The confidence interval error bars are presented in Figure 5.12 below.

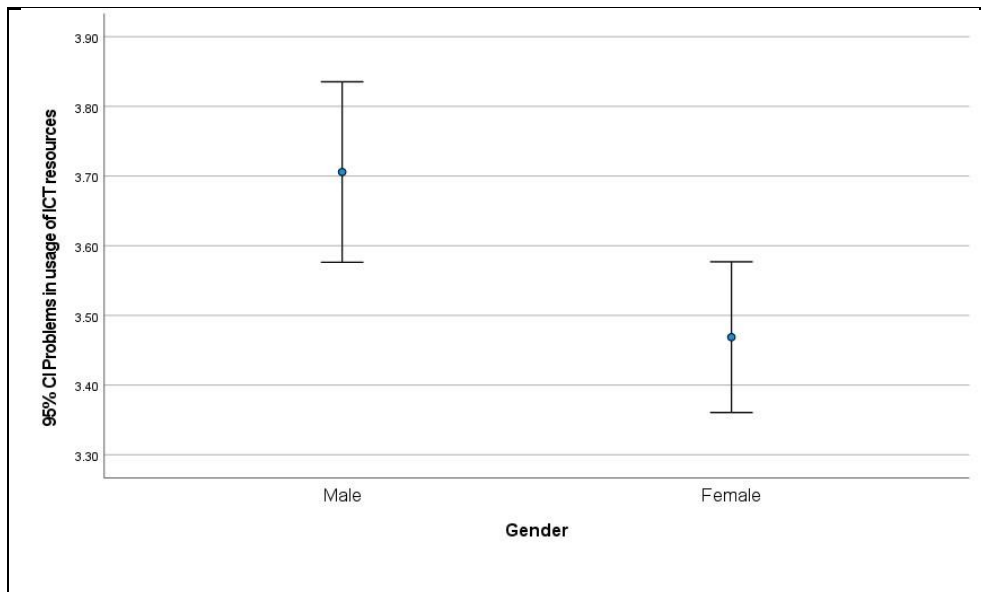


Figure 5.12: Problems in the usage of ICT resources confidence interval error bars by gender

The mean for males was close to four while for females it was close to three. This suggests that on issues on problems in usage of ICT resources on average, males agreed while females were neutral.

The composite variable on problems in usage of library resources gave an independent t-test with a t-value of 2.657 and a p-value of .008 ($t(364) = 2.657, p = .008$) leading to the conclusion that there was a significant difference in mean scores across gender. The mean score for males ($M = 3.72, SD = 1.12$) was significantly higher than that of females ($M = 3.42, SD = 1.03$). The magnitude of the difference in the means (mean difference = .30, 95% CI: =.08 to .52) was of a small effect, $\eta^2 = .03$. About 3% of the total variation in problems in usage of library resources was accounted for gender. The confidence interval error bars are presented in Figure 5.13 below.

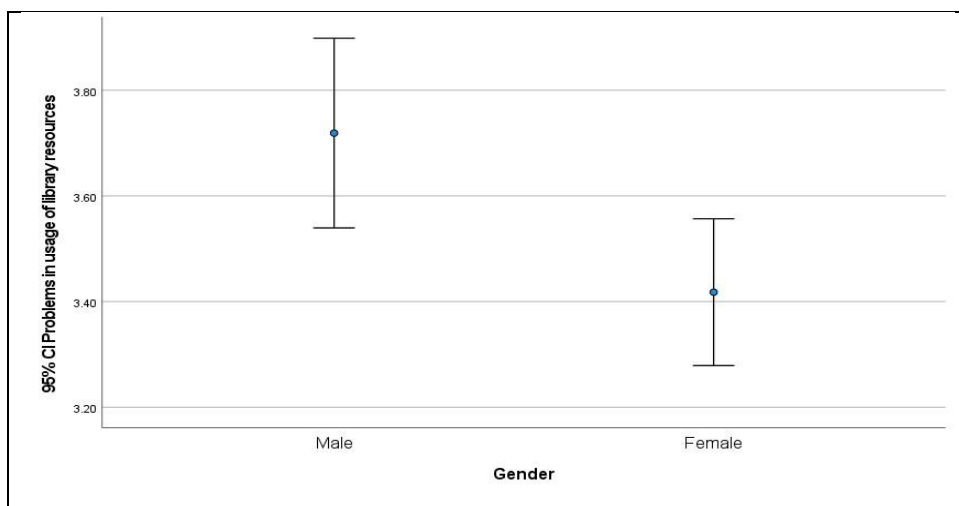


Figure 5.13: Problems in usage of library resources confidence interval error bars by gender

The mean for males was close to four while for females it was close to three. This suggests that on issues on problems in usage of library resources on average, males agreed while females were neutral.

5.7.2 ANOVA test to determine difference in mean scores by age

Age group was classified into three groups, which were ≤ 20 years, 21 – 25 years and 26 – 30 years. The results of the ANOVA tests are presented in Table 5.31.

Table 5.31: ANOVA test for difference in mean scores by age

Constructs	Levene's test for equality of variance		Test for equality of means	
	<i>F</i>	<i>p-value</i>	<i>F</i>	<i>p-value</i>
Usage of ICT resources	.275	.760	9.289	$p < .001$
Computer skills of students	18.495	$p < .001$	123.425 ^b	$p < .001$
ICT software	9.967	$p < .001$	22.966 ^b	$p < .001$
Information-seeking behaviour	19.171	$p < .001$	17.058 ^b	$p < .001$

Constructs	Levene's test for equality of variance		Test for equality of means	
	<i>F</i>	<i>p-value</i>	<i>F</i>	<i>p-value</i>
ICT support services	6.640	.001	4.591 ^b	.017
Usage of library resources	2.997	.051	8.502	$p < .001$
Problems in usage of ICT resources	1.423	.242	1.316	.270
Problems in usage of library resources	.622	.537	3.782	.024
Possible solutions in usage of library and ICT resources	15.794	$p < .001$	4.454 ^b	.015

^b Welch F-statistic

The ANOVA F tests results revealed that there was no significant difference in means across age groups with respect to problems in usage of ICT resources and thus age was not an influential factor on students' opinion. There was significant difference in means across age groups with respect to usage of ICT resources, computer skills of students, ICT software, information-seeking behaviour, ICT support services, usage of library resources, problems in usage of library resources and possible solutions in usage of library and ICT resources. As such, students' opinions differ on these issues by age.

The Levene test revealed that the variances across groups were equal ($F = .275, p = .760$) on issues on computer skills of student. The one-way ANOVA revealed that the effect of age on usage of ICT resources was significant across age groups ($F(2, 363) = 9.289, p < .001$). A small effect size, $\eta^2 = .05$ was obtained and about 5% of the total variation in usage of ICT resources was being accounted for by age. The post-hoc comparisons using Games-Howell post-hoc test were conducted to determine which age groups and the results are given in Table 5.32.

Table 5.32: Tukey HSD post-hoc test for usage of ICT resources by age

Tukey HSD^{a,b}	
--------------------------------	--

Age	N	Subset for alpha = 0.05	
		1	2
21 -25 years	317	3.4816	
=< 20 years	15	3.9000	3.9000
26 - 30 years	34		3.9657

Those aged 21 – 25 years with a mean of 3.48 ($M = 3.48$, $SD = .71$) had a significantly lower mean score than those aged 26 – 30 years with a mean of 3.97 ($M = 3.97$, $SD = .65$).

The confidence interval error bars are presented in Figure 5.14.

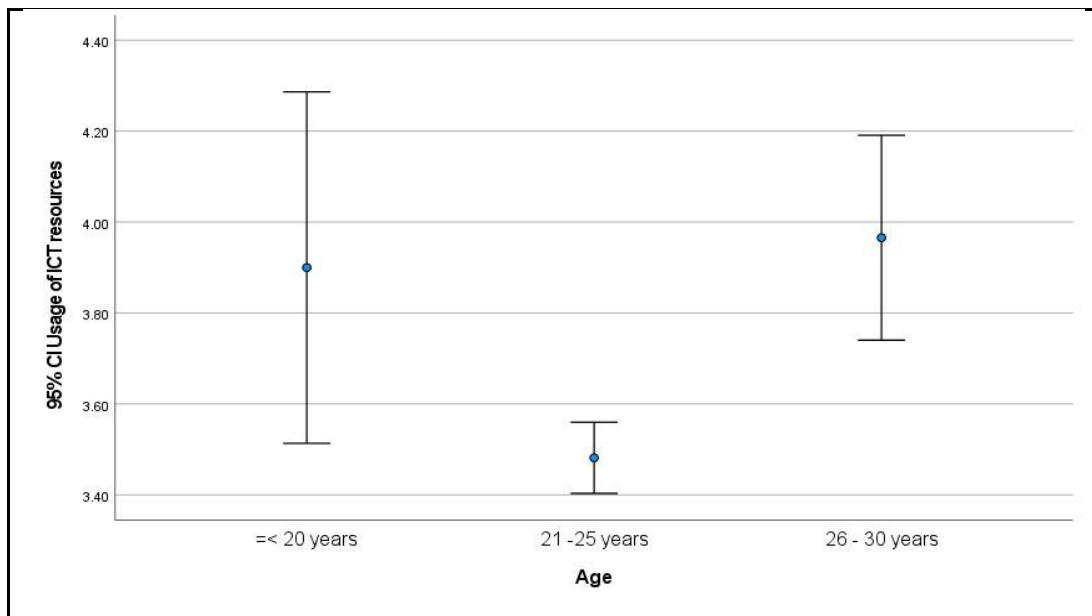


Figure 5.14: Usage of ICT resources confidence interval error bars by age

Those aged ≤ 20 years had large variability in their response as evidenced by a longer bar while those aged 21 – 25 years had scores which had less variability. The mean for those aged 21 – 25 years was approximately three indicating that on the average there were neutral while for those aged 26 – 30 years had a mean close to four indicating that on the average they agreed on issues on usage of ICT resources.

The Levene F test revealed that the homogeneity of variance assumption was not met ($F = 18.495$, $p < .001$) issues on computer skills of student. The Welch F- test for computer skills of

students showed a statistical significance difference ($F(2, 55.804) = 123.425, p < .001$) suggesting difference in means across age groups. The estimated omega squared ($\omega^2 = .40$) was of a large effect and indicated that approximately 40% of the total variation in computer skills for students was attributable to differences between the age groups. The Games-Howell post-hoc comparisons tests are presented in Table 5.33.

Table 5.33: Games-Howell post-hoc test for computer skills of student by age

Games-Howell	Age	N	Subset for alpha = 0.05	
			1	2
	26 - 30 years	34	4.1337	
	21 -25 years	317	4.2733	
	=< 20 years	15		4.8545

Those aged ≤ 20 years had a significantly higher mean score ($M = 4.85, SD = .10$) than those aged 26 – 30 years ($M = 4.13, SD = .76$) and those aged 21 – 25 years ($M = 4.27, SD = .48$). The confidence interval error bar is presented in Figure 5.15 below.

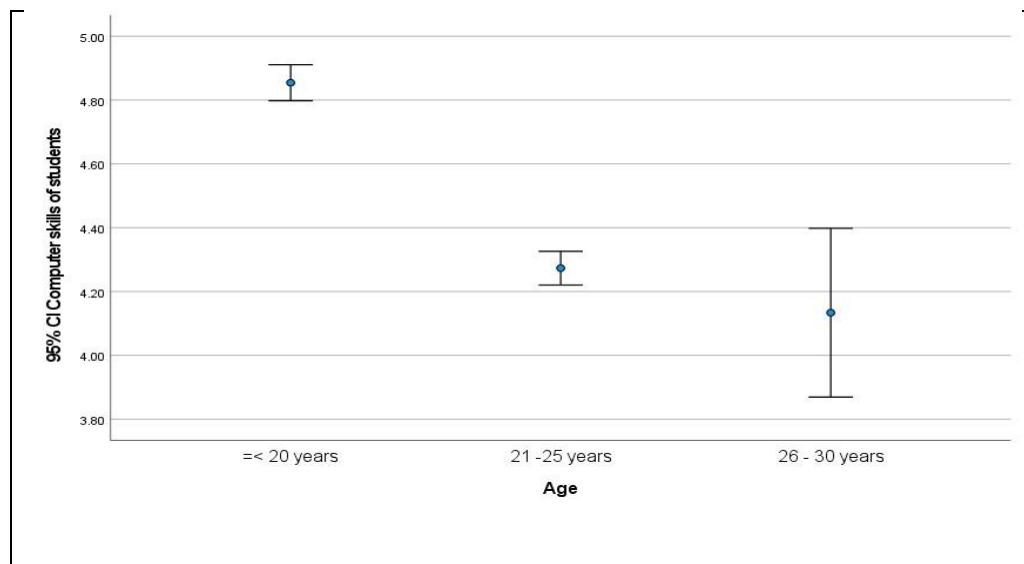


Figure 5.15: Computer skills of students' confidence interval error bars by age

Those who are less or equal to 20 years had a mean close to five while the other age groups had a mean close to four. The results revealed that the younger group strongly agreed with issues on computer skills of students while those aged 21 – 30 just agreed.

The Levene test of equality of variance across groups was not met ($F_{9.967}, p < .001$) on issues on ICT software. The Welch F-test on ICT software revealed that the means across the age groups were statistically significant ($F(2,37.301) = 22.966, p < .001$). A moderate effect size of $\omega^2 = .11$ was obtained and approximately 11% of the total variation in ICT software was accounted for by the age groups. The Games-Howell post-hoc test comparison test results are given in Table 5.34.

Table 5.34: Games-Howell post-hoc test for ICT software by age

Games-Howell	Age	N	Subset for alpha = 0.05	
			1	2
	26 - 30 years	34	3.7706	
	21 -25 years	317	3.8189	
	=< 20 years	15		4.2933

Those aged less or equal to 20 years had a significantly higher mean score ($M = 4.29, SD = .24$) than those aged 26 – 30 years ($M = 3.77, SD = .99$) and those aged 21 – 25 years ($M = 3.82, SD = .60$). The confidence interval error bars are given in Figure 5.16 below.

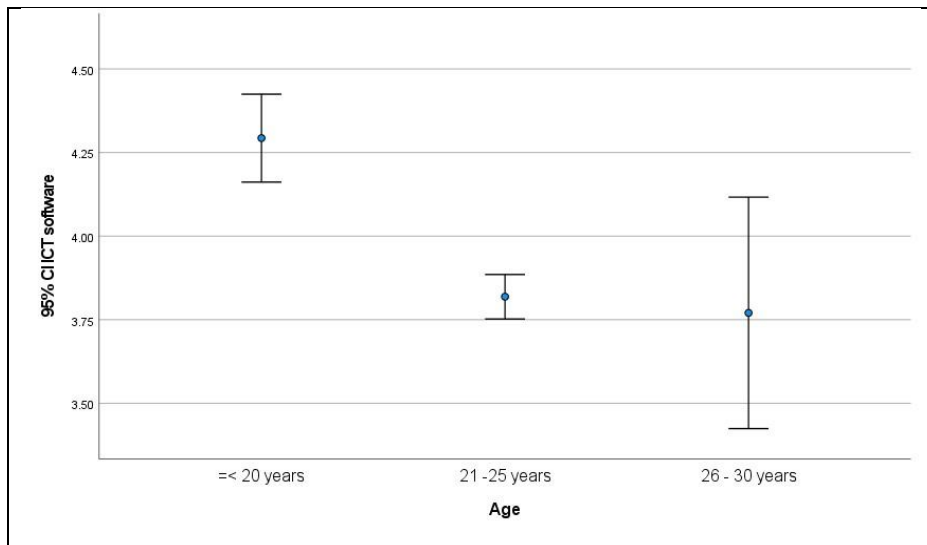


Figure 5.16: ICT software confidence interval error bars by age

All means were close to four, however, the agreement level was higher for the younger group than the other groups. There was a decreasing trend as those in the 26-30 years had the lowest mean.

The Levene test revealed that the variances across groups were not equal ($F = 19.171, p < .001$) on issues on information-seeking behaviour. The one-way ANOVA Welch F-tests revealed that the issue on information-seeking behaviour showed statistically significant difference of mean scores across age groups ($F(2, 34.153) = 17.058, p < .001$). A moderate effect size, of .08, that is, $\omega^2 = .08$ was obtained and approximately 8% of the total variation in information-seeking behaviour was being accounted for by age. The Games-Howell post-hoc comparison tests are shown in Table 5.35.

Table 5.35: Games-Howell post-hoc test for information-seeking behaviour by age

Games-Howell	Age	N	Subset for alpha = 0.05	
			1	2
	21 -25 years	317	4.3580	
	=< 20 years	15	4.4000	4.4000
	26 - 30 years	34		4.7941

The major difference was between those aged 21 – 25 years with a mean of 4.36 ($M = 4.36$, $SD = .68$) and those aged 26 – 30 years with a mean of 4.79 ($M = 4.79$, $SD = .37$).

The confidence interval error bars are presented in Figure 5.17 below.

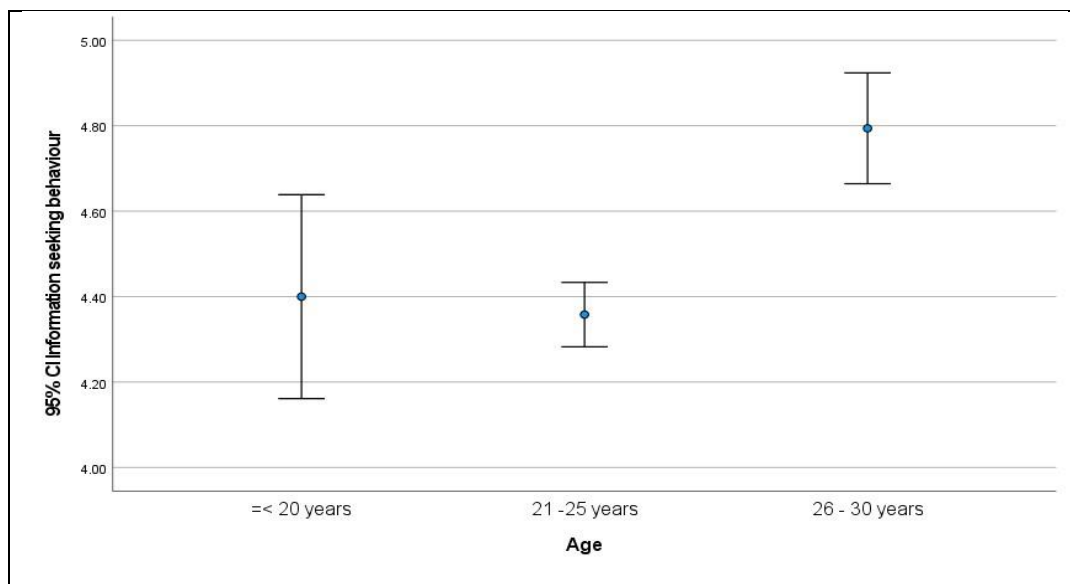


Figure 5.17: Information-seeking behaviour confidence interval error bars by age

Those aged 26 – 30 years had a mean close to four indicating that they strongly agreed on issues on information-seeking behaviour while those aged 21 – 25 years had a mean close to four indicating that they agreed on issues on information-seeking behaviour.

The Levene F test revealed that the homogeneity of variance assumption was not met ($F = 6.640, p = .001$) on issues on ICT support services. The Welch robust test of equality of means revealed that there was difference in means on issues on ICT support services across age groups ($F(2, 35.93) = 4.591, p = .017$). A small effect size, $\omega^2 = .02$ was obtained and approximately about 2% of the total variation in ICT support services was accounted for by age. The Games-Howell post-hoc test results are given in Table 5.36.

Table 5.36: Games-Howell post-hoc test for ICT support services by age

Games-Howell	Age	N	Subset for alpha = 0.05	
			1	2
	21 -25 years	317	3.5615	
	=< 20 years	15	3.5778	3.5778
	26 - 30 years	34		3.8725

The major difference was between those aged 21 – 25 years and those aged 26 – 30 years. Results indicated that the mean for those aged 21 – 25 years ($M = 3.56, SD = 1.03$) was significantly lower than the mean for those aged 26 – 30 years ($M = 3.87, SD = .50$). The confidence interval error bars are presented in Figure 5.18.

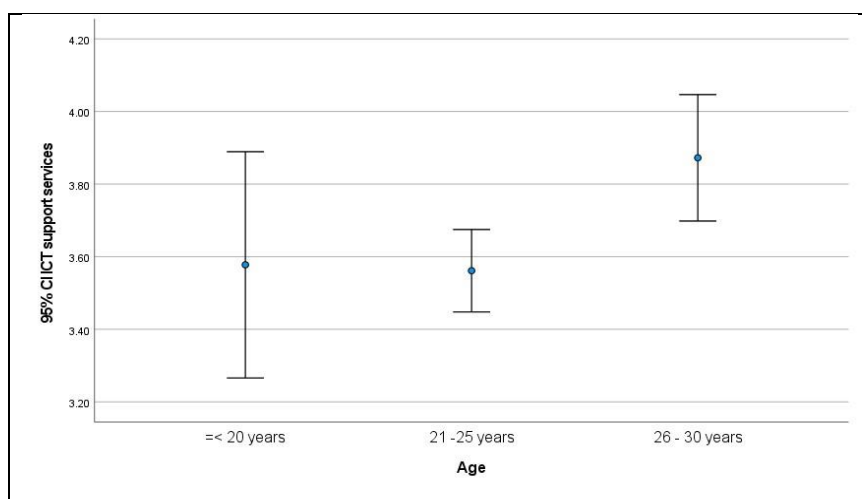


Figure 5.18: ICT support services confidence interval error bars by age

All means were close to four but the level of agreement on issues on ICT support services was higher for those aged 26 – 30 years than the other groups.

The Levene test revealed that the variances across groups were equal ($F = 2.997, p = .051$) on issues on usage of library resources. The ANOVA F-test results for usage of library resources showed a statistical significance difference across age groups ($F(2,363) = 8.502, p < .001$). The estimated effect size, $\eta^2 = .04$ was of a small effect and about 4% of the total variation in usage of library resources was accounted for age. The Tukey-HSD post hoc test results are given in Table 5.37.

Table 5.37: Tukey-HSD post-hoc test for usage of library resources

Tukey HSD^{a,b}			
Subset for alpha = 0.05			
Age	N	1	2
21 -25 years	317	3.6025	
=< 20 years	15	3.9333	3.9333
26 - 30 years	34		4.3431

Those aged 21 – 25 years ($M = 3.60, SD = 1.05$) had a significantly lower mean than those aged 26 – 30 years ($M = 4.34, SD = .65$) which was the highest. The confidence interval error bars are given in Figure 5.19 below.

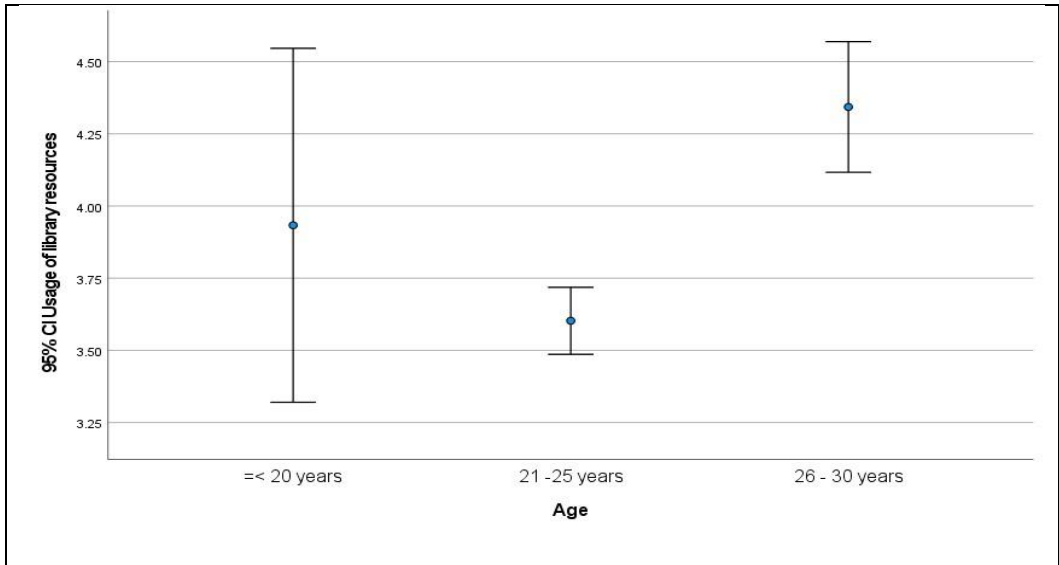


Figure 5.19: Usage of library resources confidence interval error bars by age

All means were close to four but the level of agreement on issues on usage of library resources was higher for those aged 26 – 30 years than the other groups.

The Levene test revealed that the variances across groups were equal ($F = .622, p = .537$) on issues on problems in usage of library resources. The ANOVA F-test showed a statistically significant difference between the effect of age on usage of library resources ($F(2,363) = 3.782, p = .024$). There was one pair of means that was statistically different from each other. A small effect size of $\eta^2 = .02$ was obtained and approximately 2% of the total variation in usage of library resources was accounted for by age. The Tukey HSD post hoc test results are given in Table 5.38.

Table 5.38: Tukey HSD post-hoc test for problems in usage of library resources by age

Tukey HSD ^{a,b}			
Subset for alpha = 0.05			
Age	N	1	2
=< 20 years	15	2.8000	
26 - 30 years	34		3.5588

Tukey HSD ^{a,b}			
Age	N	Subset for alpha = 0.05	
		1	2
21 -25 years	317		3.5773

Those aged less or equal to 20 years ($M = 2.80$, $SD = 1.18$) had a significantly lower mean than those aged 26 – 30 years ($M = 3.56$, $SD = 1.07$) and those aged 21 – 25 years ($M = 3.58$, $SD = 1.06$). The confidence interval error bars are given in Figure 5.20 below.

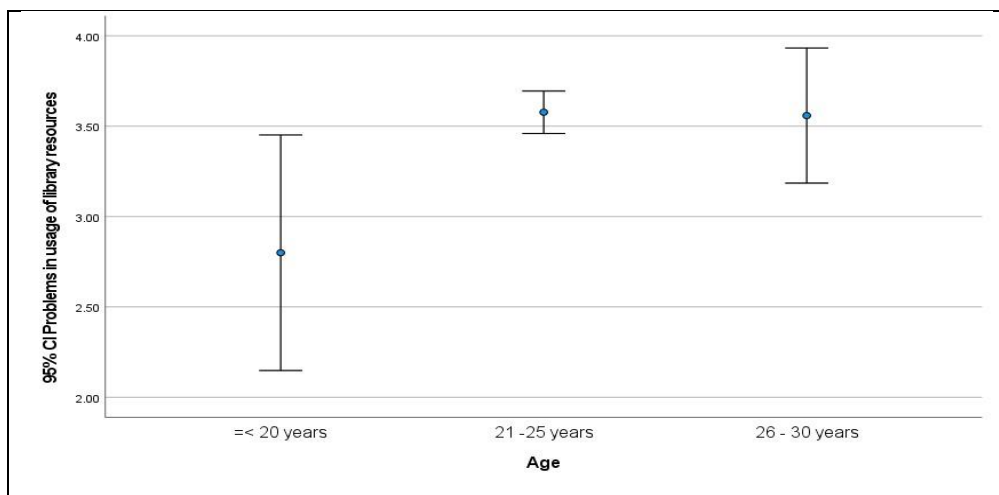


Figure 5.20: Problems in the usage of library resources confidence interval error bars by age

Those aged less or equal to 20 years had more variation in scores than any group as evidenced by a longer error bar. Those aged less or equal to 20 years had mean close to three while the other groups had means close to four. Those aged less or equal to 20 years were neutral on problems in usage of library resources while those aged 21 – 30 years agreed.

The Levene test revealed that the variances across groups were not equal ($F = 15.794$, $p < 001$) on issues on possible solutions in usage of library and ICT resources. The Welch tests r showed statistically significant difference of mean scores across age groups ($F(2,63.369) = 4.454$, $p = .015$). A small effect size, of .02, that is, $\omega^2 = .02$ was obtained and approximately 2% of the total variation in possible solutions in usage of library and ICT resources was being accounted for by age. The Games-Howell post-hoc test is given in Table 5.39.

Table 5.39: Games-Howell post-hoc test for possible solutions in usage of library and ICT resources by age

Games-Howell	Age	N	Subset for alpha = 0.05	
			1	2
	=< 20 years	15	3.8190	
	21 -25 years	317		3.9563
	26 - 30 years	34	3.9664	3.9664

The main difference was between those aged less or equal to 20 years with a mean of 3.82 ($M = 3.82, SD = .13$) and those aged 21 – 25 years with a mean of 3.96 ($M = 3.96, SD = .68$). The confidence interval error bars are given in Figure 5.21 below.

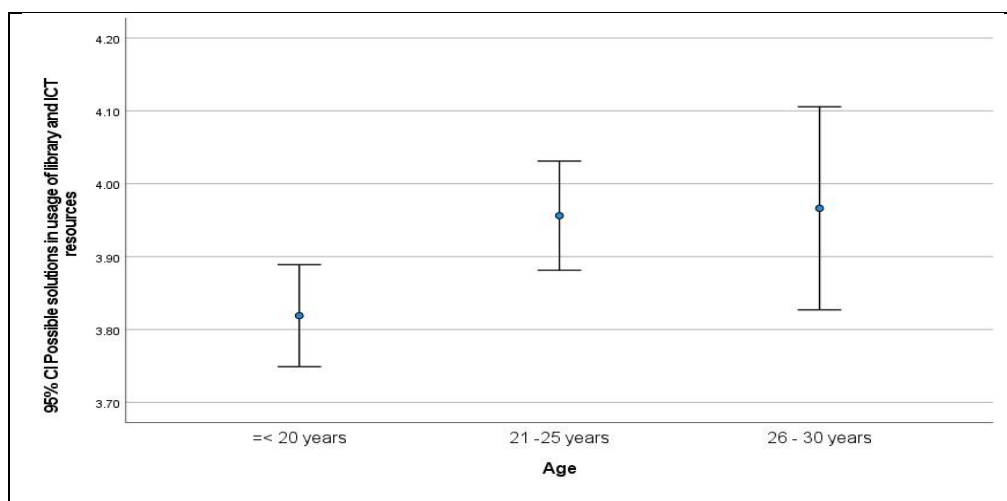


Figure 5.21: Possible solutions in usage of library and ICT resources confidence interval error bars by age

All means were close to four. The agreement level was more for those aged 26 – 30 years than for the other groups on issues on possible solutions in usage of library and ICT resources.

5.7.3 ANOVA test to determine difference in mean scores by academic levels

The academic levels are 100, 200, 300 and 400 respectively. The ANOVA test for equality of means is given in Table 5.40.

Table 5.40: ANOVA test for difference in mean scores by academic level

Constructs	Levene's test for equality of variance		Test for equality of means	
	<i>F</i>	<i>p-value</i>	<i>F</i>	<i>p-value</i>
Usage of ICT resources	2.370	.070	.459	.711
Computer skills of students	7.694	$p < .001$.303 ^b	.823
ICT software	4.441	.004	4.404 ^b	.005
Information-seeking behaviour	7.281	$p < .001$	2.666 ^b	.049
ICT support services	6.385	$p < .001$	2.245 ^b	.084
Usage of library resources	5.913	.001	7.148 ^b	$p < .001$
Problems in usage of ICT resources	6.674	$p < .001$.374 ^b	.772
Problems in usage of library resources	.721	.540	3.962	.008
Possible solutions in usage of library and	7.480	$p < .001$	3.317 ^b	.021

^b Welch F-statistic

The ANOVA F test results revealed that there was no significant difference in means across levels with respect to usage of ICT resources, computer skills of students, ICT support services, and problems in usage of ICT resources and thus academic level was not an influential factor on students' opinion. There was significant difference in means across age groups with respect to ICT software, information-seeking behaviour, usage of library resources, problems in usage of library resources and possible solutions in usage of library and ICT resources. Student's opinions differ on these issues by academic level.

The Levene test revealed that the homogeneity of variance assumption was not met ($F_{4.441, p} = .004$) on issues on ICT software. The Welch F-test revealed that ICT software showed a statistically significant difference ($F(3, 199.349) = 4.404, p = .005$) across levels. A small effect size of .03 was obtained and approximately 3% of the total variation in ICT software was accounted for academic level. The Games-Howell post hoc comparison is given in Table 5.41.

Table 5.41: Games-Howell post-hoc test for ICT software by level

Games-Howell	Level	N	Subset for alpha = 0.05	
			1	2
	100	90	3.6200	
	200	90	3.8378	3.8378
	300	90		3.9000
	400	96		3.9687

Those in academic level 100 had the lowest mean of 3.62. ($M = 3.62, SD = .74$) which was significantly lower than those in academic level 300 who had a mean of 3.90 ($M = 3.90, SD = .65$) and those in academic level 400 who had a mean of 3.97 ($M = 3.97, SD = .58$) which was the highest. The confidence interval error bars are given in Figure 5.22 below.

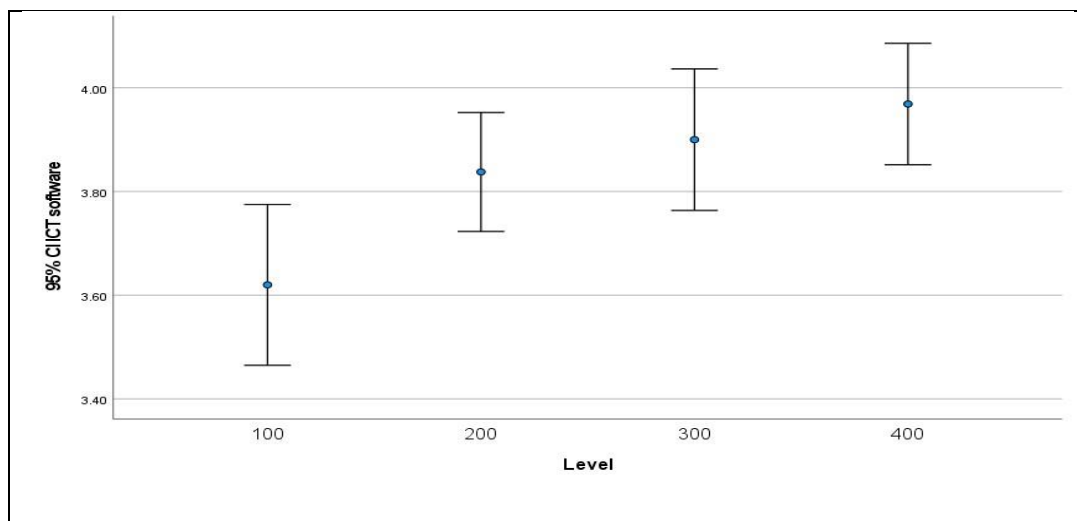


Figure 5.22: ICT software confidence interval error bars by level

All means were close to four. The level of agreement increases as the academic level increases. Thus, those in higher levels were more in agreement than the lower levels on issues on ICT software.

The Levene test revealed that the assumption of equal variances across groups was not met ($F = 7.281, p < .001$) on issues on information-seeking behaviour. The Welch F-test showed a statistically significant difference ($F(3,198.544) = 2.666, p = .049$) across levels. A small effect size of .01 was obtained and approximately 1% of the total variation on issues in information-seeking behaviour is being explained by levels. The Games-Howell post-hoc test results are given in Table 5.42.

Table 5.42: Games-Howell post-hoc test for information-seeking behaviour by level

Games-Howell	Level	N	Subset for alpha = 0.05	
			1	2
			100	90
400	96	4.4427	4.4427	
200	90	4.4611	4.4611	
300	90		4.4833	

Those in the lower level, that is 100 had the lowest mean of 4.21 ($M = 4.21, SD = .76$) which was significantly difference from those in level 300 with a mean of 4.48 ($M = 4.48, SD = .69$) which was the highest. The confidence interval error bars are given in Figure 4.12 below.

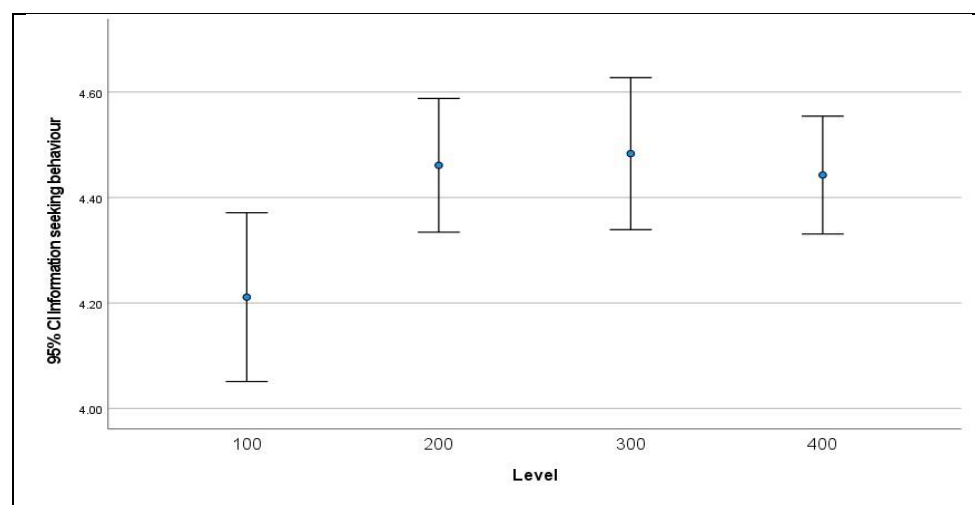


Figure 5.23: Information-seeking behaviour confidence interval error bars by level

All means were close to four. Those in academic level 400 were more in agreement on issues on information-seeking behaviour.

The Levene test revealed that the assumption of equality of variances across groups on issues on usage of library services was not met ($F = 5.913, p = .001$). The Welch F-tests results showed a statistically significant difference in mean scores across academic levels ($F(3,195.969) = 7.148, p < .001$). A small effect size, of .05 that is, $\omega^2 = .05$ was obtained and about 5% of the total variation in usage of library services was being accounted for by level. The Games-Howell post-hoc tests are given in Table 5.43.

Table 5.43: Games-Howell post-hoc test for usage of library resources

Games-Howell	Level	N	Subset for alpha = 0.05	
			1	2
	200	90	3.4907	
	300	90	3.6037	
	100	90	3.6037	
	400	96		4.0191

The highest mean was from those in level 400 with a mean of 4.02 ($M = 4.02, SD = .76$) which was significantly different from those in level 200 with a mean of 3.49 ($M = 3.49, SD = .93$), those in level 100 with a mean of 3.60 ($M = 3.60, SD = 1.22$) and those in level 100 with a mean of 3.60 ($M = 3.60, SD = 1.15$). The confidence interval error bars are given in Figure 5.24 below.

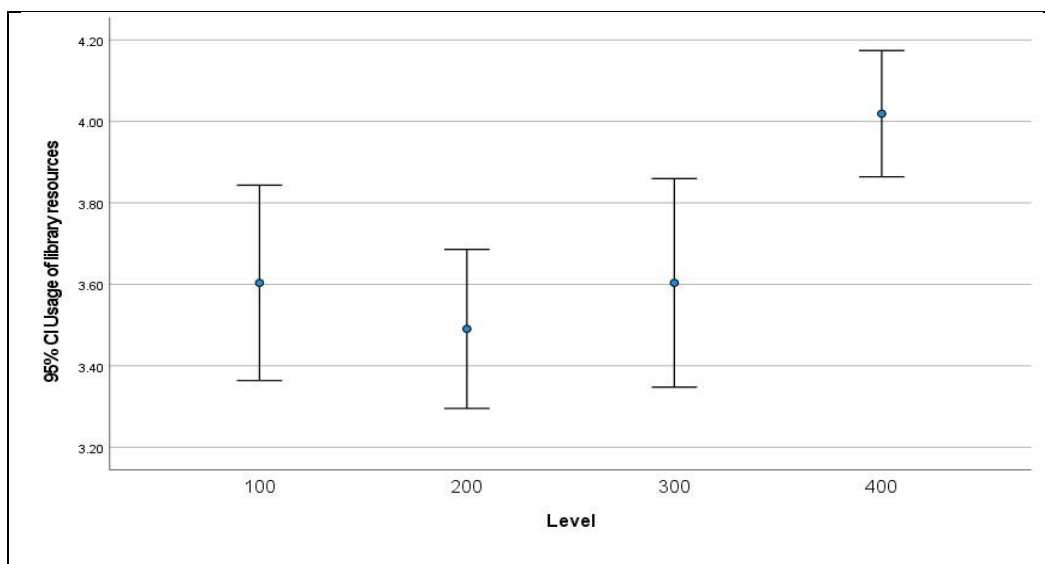


Figure 5.24: Usage of library resources confidence interval error bars by level

Those in level 100, 300 and 400 had means close to four while those in level 200 had a mean close to three. Those in academic level 400 were more in agreement than those in the lower academic level on issue son usage of library resources.

The Levene test revealed that the variances across groups were equal ($F = .721, p = .54$) on issues on problems in usage of library resources. The ANOVA F-tests results for problems in usage of library resources showed a statistically significant difference ($F(3,362) = 3.962, p = .008$). A small effect size of .03 was obtained and approximately 3% of the total variation in problems in usage of library resources was being explained by academic levels. The Tuckey HSD post-hoc test results are given in Table 5.44.

Table 5.44: Tukey-HSD post-hoc test for problems in usage of library resources by level

Tukey HSD ^{a,b}			
Level	N	Subset for alpha = 0.05	
		1	2
200	90	3.2611	
300	90	3.5111	3.5111

Tukey HSD ^{a,b}			
Level	N	Subset for alpha = 0.05	
		1	2
400	96	3.5990	3.5990
100	90		3.8000

Those in academic level had the lowest mean of 3.26 ($M = 3.26, SD = 1.01$) which was statistically different from those in academic level 100 who had the highest mean of 3.8 ($M = 3.80, SD = .96$). The confidence interval error bars are given in Figure 5.24 below.

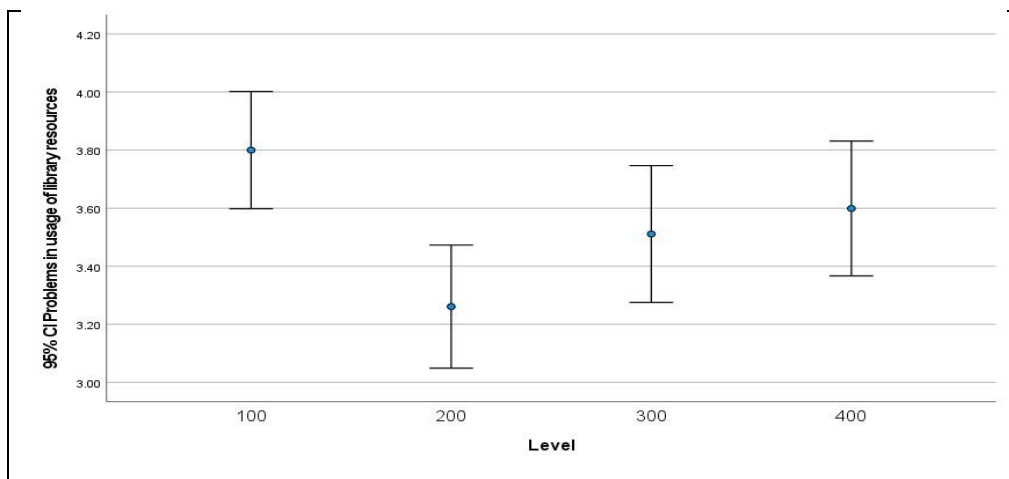


Figure 5.25: Problems in usage of library resources confidence interval error bars by level

Those in academic level 200 had a mean close to three while those in academic level 100 had a mean close to four. Those in academic level 100 agreed on issues on problems in usage of library resources while those in academic level 200 were neutral.

The Levene test revealed that the assumption of equal variances across groups was not met ($F = 7.48, p < .001$) on issues on possible solutions in usage of library and ICT resources. The results of the ANOVA F-test showed that possible solutions in usage of library and ICT showed a statistically significant difference ($F(3,198.970) = 3.317, p = .021$) across levels. A small effect size of .02 was obtained and approximately 2% of the total variation in possible solutions

in usage of library and ICT resources was accounted for by levels. The Games-Howell post-hoc test results are given in Table 5.45.

Table 5.45: Games-Howell post-hoc test for possible solutions in usage of library and ICT resources by level

Games-Howell	Level	N	Subset for alpha = 0.05	
			1	2
	200	90	3.7587	
	300	90	3.9810	3.9810
	100	90	3.9810	3.9810
	400	96		4.0774

Those in academic level 200 had a mean of 3.76. ($M = 3.76, SD = .78$) which was significantly lower than for those in academic level 400 with a mean of 4.08 ($M = 4.08, SD = .57$) which was the highest. The confidence interval error bars are given in Figure 5.25 below.

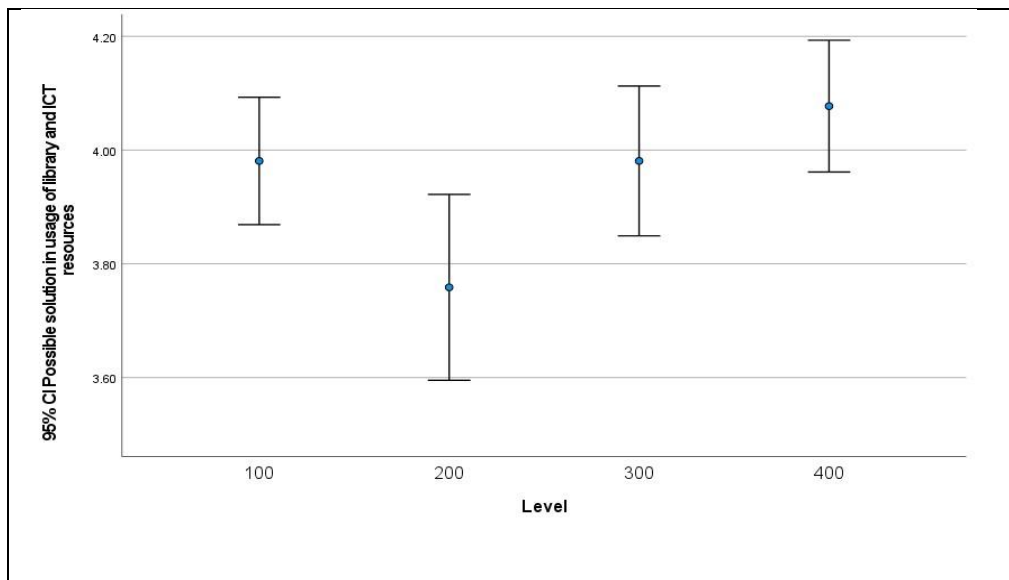


Figure 5.26: Possible solutions in usage of library and ICT resources confidence interval error bars by level

All means were close to four. Those in academic level 400 were more in agreement on issues on possible solutions in usage of library and ICT resources.

5.8 Structure Equation Modelling (SEM)

This study aimed to examine the effect of usage of ICT resources, library resources, support services, and ICT software on students' computer skills and the effect of usage of ICT resources, library resources, support services, software and computer skills on students' informative seeking behaviour in UCC. The model was configured using IBM AMOS application (version 27). The evaluation of the structural model is based on the steps recommended by Hair et al. (2019) for such analysis. Two structural models were fitted to the data, one where student's computer skills were the dependent variable and the other were information-seeking behaviour was the dependent variable. In each case, the measurement model using confirmatory factor analysis was first evaluated and then followed by the structural model. The models are discussed in the following subsections.

5.8.1 SEM for determinants of students' computer skills

The conceptual model for the effect of usage of ICT resources, library resources, support services, and ICT software on students' computer skills is given in Figure 5.26.

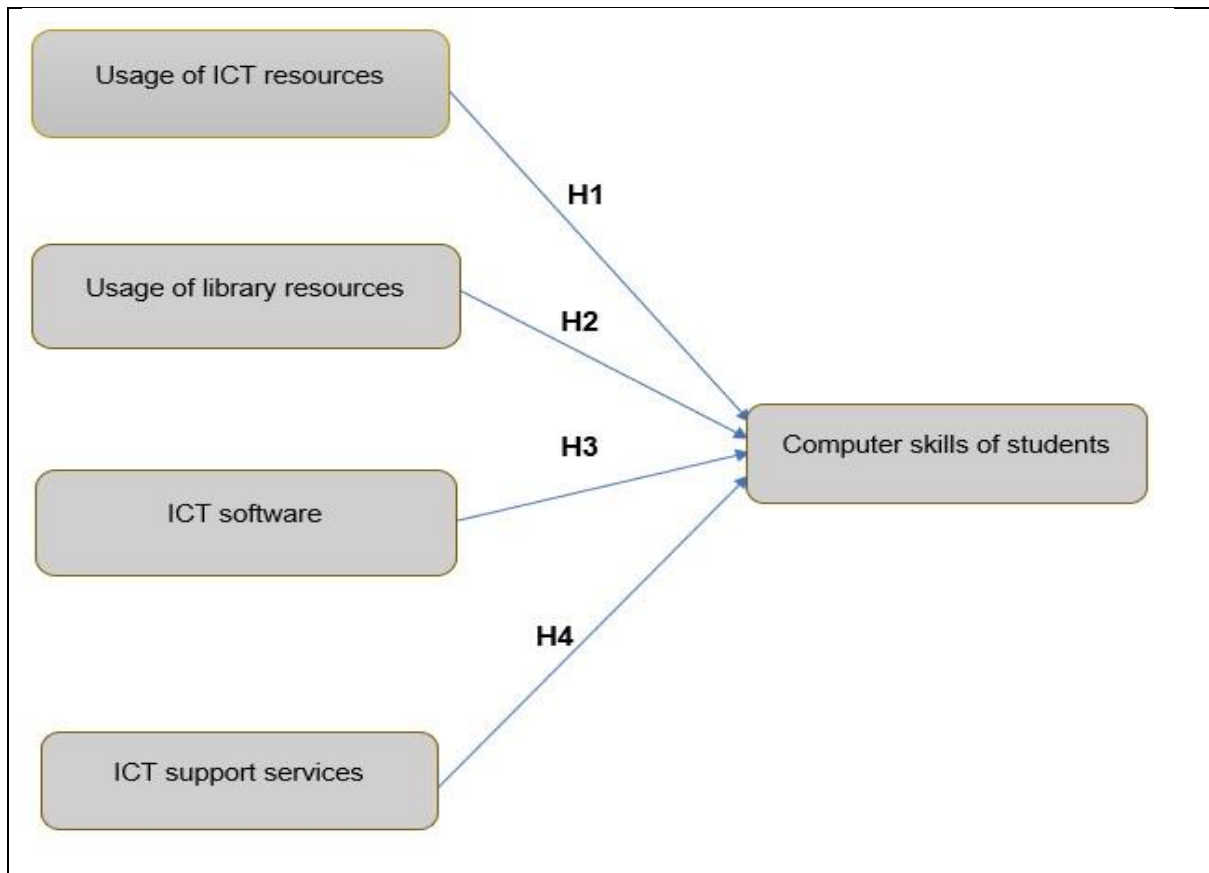


Figure 5.27: The study conceptual model predicting computer skills of students

The maximum likelihood (ML) estimation method was used to assess both the measurement model and the structural model, and the models are discussed in the next sub-sections.

5.8.2 Confirmatory factor analysis (CFA) of the model

For the first model, a confirmatory factor analysis was done using the following constructs:

Usage of ICT resources (MSIF);

- Usage of library resources (ICTSS);
- ICT software (UAS); □ ICT support services (SS); and
- Computer skills of students (CS).

The following cut-off criteria for model fit as proposed by Hu and Bentler (1999), Gaskin and Lim (2016) and Hair, et al., (2019) were used to evaluate the measurement model and the structural model.

Table 5.46: Cut-off criteria for the fit indexes commonly reported for CFA and SEM

Measure	Name	Cut-off for acceptable fit	Cut-off for good fit
χ^2	Model Chi-Square		p-value > .05
CMIN/DF χ^2 () df	Chi-square value and its associated degrees of freedom statistic	Between 3 and 5	Between 1 and 3
GFI	Goodness of Fit	$.90 \leq GFI \leq .95$	$GFI \geq .95$
RMSEA	Root Mean Square Error of Approximation	$.08 < RMSEA < .06$	$RMSEA < .06$
SRMR	(Standardized) Root Mean Square Residual	$.10 < SRMR < .08$	$SRMR < .08$
AGFI	Adjusted Goodness of Fit	$AGFI \geq .90$	$AGFI \geq .90$
CFI	Comparative Fit Index	$.90 \leq CFI \leq .95$	$CFI \geq .95$
(N)NFI	(Non) Normed-Fit Index	$.90 \leq NFI \leq .95$ $.90 \leq NNFI \leq .95$	$NFI \geq .95$ $NNFI \geq .95$
TLI	Tucker Lewis index	$.90 \leq TLI \leq .95$	$NFI \geq .95$
Measure	Name	Cut-off for acceptable fit	Cut-off for good fit
PClose	p-value for testing the null hypothesis that the population RMSEA is no greater than .05	$.01 \leq PClose \leq .05$	$PClose > .05$

Source: Hu and Bentler (1999), Gaskin and Lim (2016) and Hair Jr et al. (2019)

According to Gaskin and Lim (2016) a combination of measures where $CFI > .95$ and $SRMR < .08$ is a good combination which can be solidified further by $RMSEA < .06$.

The confirmatory factor analysis on the model on computer skills of students presented in Figure 5.27 below.

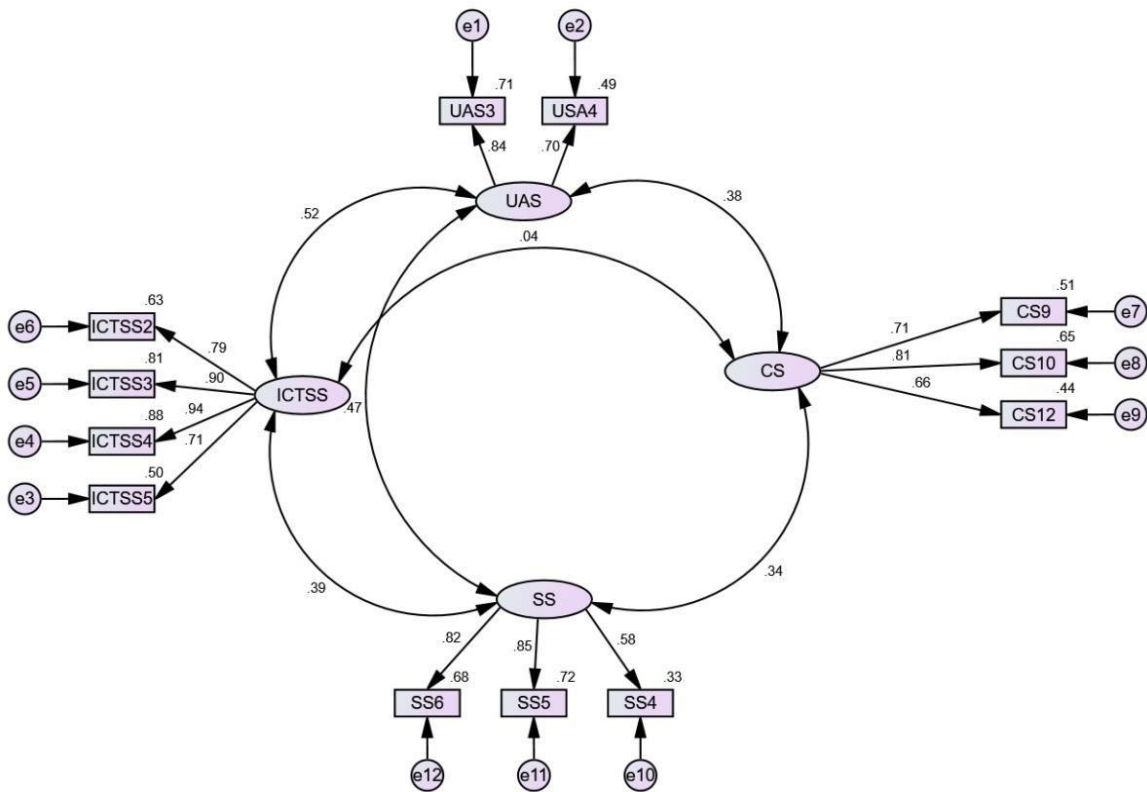


Figure 5.28: Confirmatory factor analysis model computer skills of students

All standardised loading estimates were at least .5 and the construct on usage of ICT resources (MSIF) was dropped from the analysis in order to achieve model fitness. The summary fit measures of the confirmatory factor analysis model on computer skills of students are given in Table 5.47.

Table 5.47: Summary model fit measures for CFA model for computer skills of students

Measure	Estimate	Threshold	Interpretation
CMIN	196.054	--	--
DF	48.000	--	--

Measure	Estimate	Threshold	Interpretation
CMIN/DF	4.084	Between 1 and 3	Acceptable
CFI	.927	>.95	Acceptable
SRMR	.058	<.08	Excellent
NFI	.906	<.06	Acceptable
IFI	.927	>.05	Acceptable

The measurement model results showed that the chi-squared (χ^2) value was 196.054 with 48 degrees of freedom resulting in a CMIN/DF value of 4.084 which is regarded as acceptable since it is between 3 and 5. The CFI, NFI and IFI were .927, .906 and .927 respectively which are acceptable. The SRMR was .058 and is regarded as excellent. According to Hair et al., (2019) typically, using three to four fit indices provides adequate evidence of model fit and using this, criteria the model was regarded as acceptable and was tested for construct validity.

5.8.3 Construct validity of the CFA model for computer skills of students

Construct validity is made up of three component which are nomological validity, convergent validity and discriminant validity.

a) Nomological validity of the CFA model for computer skills of students

Pearson correlation coefficient was used to assess nomological validity by measuring the correlation between the constructs. The guidelines proposed by Cohen (1988) which states that if $r = .10 - .29$ its low effect (low correlation); if $r = .30 - .49$ medium effect (moderate correlation) and if $r = .50 - .99$ its large effect (strong correlation) was used to evaluate the correlations. The correlation coefficients are given in Table 5.48.

Table 5.48: Correlation between variables for the model for computer skills of students

Item	UAS	SS	ICTSS	CS
ICT software (UAS)	-			
ICT support services (SS)	.400 ^{a**}	-		
Usage of library resources (ICTSS)	.409 ^{a**}	.366 ^{a**}	-	
Computer skills of students (CS)	.319 ^{a**}	.278 ^{**}	.042	-
*p < .05 statistically significant; ** p < .01 statistically highly significant				
^a r > .3 statistically significant (medium effect); ^b r > .5 statistically significant (large effect)				

Computer skills of students (CS) had statistically significant positive correlation with ICT support services ($r = .319$; $p < .001$) and usage of library resources ($r = .278$; $p < .001$). The correlations were of medium and low effect respectively. High values in computer skills of students are associated with high values in ICT support services and usage of library resources. The usage of library resources (ICTSS) had a statistically significant positive relationship with ICT software and ($r = .409$; $p < .001$) and ICT support services ($r = .366$; $p < .001$). The correlations were both of medium effect. High values in usage of library resources are associated with high values in ICT software and ICT support services. ICT software had a moderately significant positive relationship with ICT support services ($r = .248$; $p < .001$). High values in ICT software are associated with higher values in ICT support services. The constructs in the measurement theory have correlations that make sense.

b) Convergent validity of the CFA model for computer skills of students

Construct reliability or composite reliability (CR) and Average Variance Extracted (AVE) are given in Table 5.49.

Table 5.49: Standardised loadings, construct reliability and AVE for CFA model for computer skills of students

Construct	Item	Standard loading	Construct Reliability (CR)	Average Variance Extracted (AVE)
Usage of library resources (ICTSS)	ICTSS5	.709	.904	.704
	ICTSS4	.936		
	ICTSS3	.901		
	ICTSS2	.792		
ICT software (UAS)	UAS3	.843	.750	.601
	UAS4	.702		
Computer skills of students (CS)	CS9	.712	.772	.532
	CS10	.808		
	CS12	.660		
ICT Support services (SS)	SS4	.576	.800	.578
	SS5	.851		
	SS6	.824		

Composite reliability was accurately measured for all the constructs because they have score greater than .7. The average variance extracted (AVE) scores, showed that all the constructs accurately and significantly measured convergent validity ($AVE > .5$). Convergent validity was achieved.

c) Discriminant validity of the CFA model for computer skills of students

Discriminant validity is an estimate for the factor correlation and to be able to clearly discriminate between two factors, according to Fornell and Larcker (1981) it is achieved if a

latent variable accounts for more variance in its associated indicator variables than it shares with other constructs in the same model. It is achieved if the square root of each construct's AVE is more than the inter-construct correlations and the maximum shared variance (MSV) is less than AVE. The results of discriminant validity are presented in Table 5.50 where the square root of AVE on the diagonal of the matrix, the squared inter-construct correlations (SICs) are in the top half and the inter-construct correlations are in the bottom half.

Table 5.50: AVE, MSV, Inter-construct correlations and Squared Interconstruct correlations (SICs) for CFA Model for computer skills of students

Construct	AVE	MSV	1 (ICTSS)	2 (SS)	3 (UAS)	4 (CS)
Usage of library resources (ICTSS)	.704	.269	.839	.154	.268	.002
2. ICT support services (SS)	.578	.217	.392***	.760	.217	.114
3. ICT software (UAS)	.601	.269	.518***	.466***	.776	.141
Computer skills of students (CS)	.532	.141	.041	.337***	.376***	.729
† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$						

The square root of the AVEs are more than the corresponding inter-construct correlations and all the AVEs are more than the Squared Inter-construct Correlations (SICs) and thus discriminant validity was achieved.

5.8.4 Structural equation model for computer skills of students

The same goodness of fit statistics used in the CFA were used to assess the structural equation model and the structural model obtain is given in Figure 5.28.

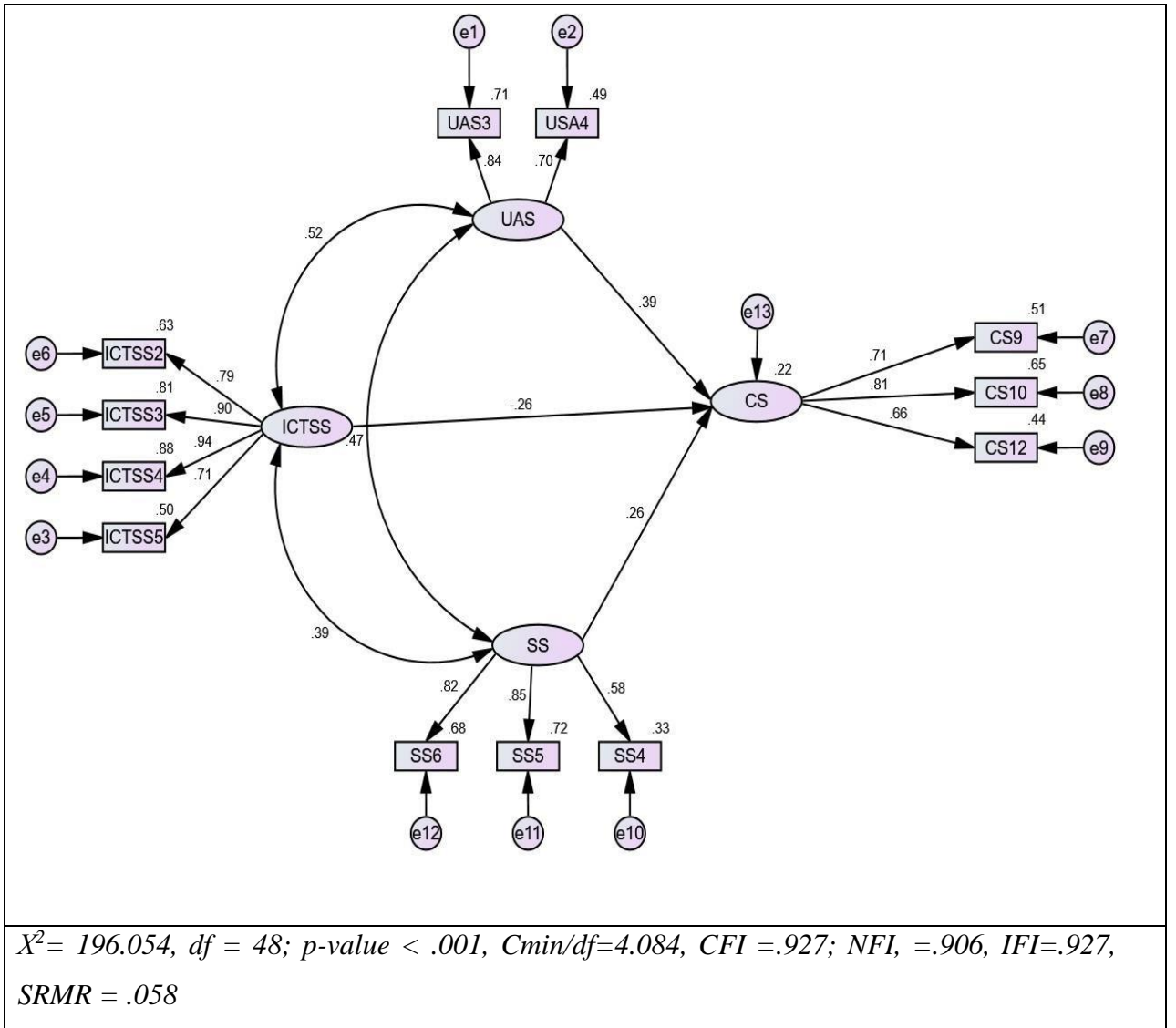


Figure 5.29: The Structural Equation Model for computer skills of students

The model fit measures for the SEM model for computer skills of students are presented in Table 5.51.

Table 5.51: Model fit measures for the SEM model for computer skills of students

Measure	Estimate	Threshold	Interpretation
CMIN	196.054	-	-
DF	48.000	-	-
CMIN/DF	4.084	Between 1 and 3	Acceptable
CFI	.927	> .95	Acceptable
SRMR	.058	< .08	Excellent

Measure	Estimate	Threshold	Interpretation
IFI	.927	>.95	Acceptable
NFI	.906	>.95	Acceptable

The structural model results were the same as the measurement model and the model was regarded as acceptable and the path estimates model and the significance of the paths are given in Table 5.51.

Table 5.52: The standardised and unstandardised regression weights from the SEM model for computer skills of students

Hypothesis	Path Name	Standardised Estimate parameter	Estimate	S.E	CR	P value
H2	CS ← ICTSS	-.263	-.212	.063	-3.373	***
H3	CS ← UAS	.392	.321	.079	4.055	***
H4	CS ← SS	.258	.262	.081	3.226	***
	UAS3 ← UAS	.843	1.000			
	UAS4 ← UAS	.702	.925	.096	9.596	***
	ICTSS5 ← ICTSS	.709	1.000			
	ICTSS4 ← ICTSS	.936	1.293	.079	16.448	***
	ICTSS3 ← ICTSS	.901	1.234	.077	15.996	***
	ICTSS2 ← ICTSS	.792	1.072	.076	14.136	***
	CS9 ← CS	.712	1.000			
	CS10 ← CS	.808	1.181	.111	10.680	***
	CS12 ← CS	.660	.832	.082	10.125	***
	SS4 ← SS	.576	1.000			
	SS5 ← SS	.851	1.671	.163	10.276	***
	SS6 ← S	.824	1.561	.152	10.271	***
*** p<.001						

The significant paths of the conceptual model on computer skills of students are CS (computer skills of students) ← ICTSS (Usage of library resources), CS (computer skills of students) ←

UAS (ICT software) and CS (computer skills of students) ← SS (ICT support services) with p-values of less than .001, less than .001 and .001 respectively leading to the rejection of the null hypothesis $H_0: \beta = 0$. All the paths, that is, CS ← ICTSS ($CR = -3.373, p < .001$), CS ← UAS ($CR = 4.055, p < .001$) and CS ← SS ($CR = 3.226, p = .001$) were statistically significant with p-values less than .01. ICT software and ICT support services had a positive influence on computer skills of students and usage of library resources had a negative influence. The construct on usage of ICT resources (MSIF) was dropped from the analysis since exclusion improved the fit of the model and thus, hypothesis H_1 was not tested. The hypotheses interpretations are presented in the following paragraphs.

H₁: Usage of ICT resources has an influence on computer skills of students

Usage of ICT resources was excluded from the model since its inclusion resulted in the model being a poor fit. The hypothesis was not tested.

H₂: Usage of library resources has an influence on computer skills of students

The results revealed that usage of library resources at UCC is a significant negative predictor of students' computer skills ($\beta = -.212, CR = -3.373, p < .001$) at the 1% level of significance leading to the rejection of the null hypothesis of no relationship ($H_0: \beta = 0$). Technically, it is thus estimated that a unit increase in scores for usage of library resources by students at UCC cause .212 decrease in scores for students' computer skills. This therefore shows library resources not having a positive impact on assisting with improving students' computer skills. This might be because in the library students use hard copies rather the online material.

H₃: ICT software has an influence on computer skills of students

ICT software at UCC is a significant positive predictor of students' computer skills ($\beta = .321; CR = 4.055; p < .001$) leading to the non-rejection of the null hypothesis of no relationship ($H_0: \beta = 0$) at the 1% level of significance. For every increase of one unit in scores for usage of ICT software by students at UCC, scores for students' computer skills, increases by .321. This implies usage of ICT software by students at UCC improves the quest to improving students' computer skills and thus, such contribution is because of the scientific interactions among the indicators considered in the model and not just by chance. The hypothesis is thus supported.

H4: ICT support services has an influence on computer skills of students

The study shows ICT support services in the university is a significant positive predictor of students' computer skills ($\beta = .262$, $CR = 3.226$, $p = .001$) at the 1% level of significance resulting in the rejection of the null hypothesis of no relationship ($H_0: \beta = 0$). For every increase of one unit in scores of ICT support services at UCC, scores for students' computer skills, increases by .262. This implies ICT support services at UCC improves the quest to improving students' computer skills and thus, such contribution is because of the scientific interactions among the indicators considered in the model and not just by chance. The hypothesis is therefore supported.

The hypotheses are summarised in Table 5.53.

Table 5.53: The result of the hypothesis for the SEM model for computer skills of students

Hypothesis	Construct	Path	Construct	Unstandardised estimate (β)	p-value	Result of hypothesis
H ₁	CS	<---	MSIF			Not tested
H ₂	CS	<---	ICTSS	-.212	$p < .001$	Reject null hypothesis at $\alpha = .05$
H ₃	CS	<---	UAS	.321	$p < .001$	Reject null hypothesis at $\alpha = .05$
H ₄	CS	<---	SS	.262	$p = .001$	Reject null hypothesis at $\alpha = .05$

Only three of the tested hypotheses were significant. The results showed that usage of library resources impact negatively on the computer skills of students while ICT software and ICT support services impact positively on the software. The summarised decisions of the model are given in Table 5.54.

Table 5.54: Overall hypothesis testing results for computer skills of students

Hypothesis	Result
<i>H₁: Usage of ICT resources has an influence on computer skills of students</i>	Not tested
<i>H₂: Usage of library resources has an influence on computer skills of students</i>	Supported
<i>H₃: ICT software has an influence on computer skills of students</i>	Supported
<i>H₄: ICT support services has an influence on computer skills of students</i>	Supported

The research hypotheses that were supported by the analysis were H₂, H₃ and H₄ and were indicating that they influence computer skills of the students. H₁ was not tested and the final model showing the significant paths is given in Figure 5.29.

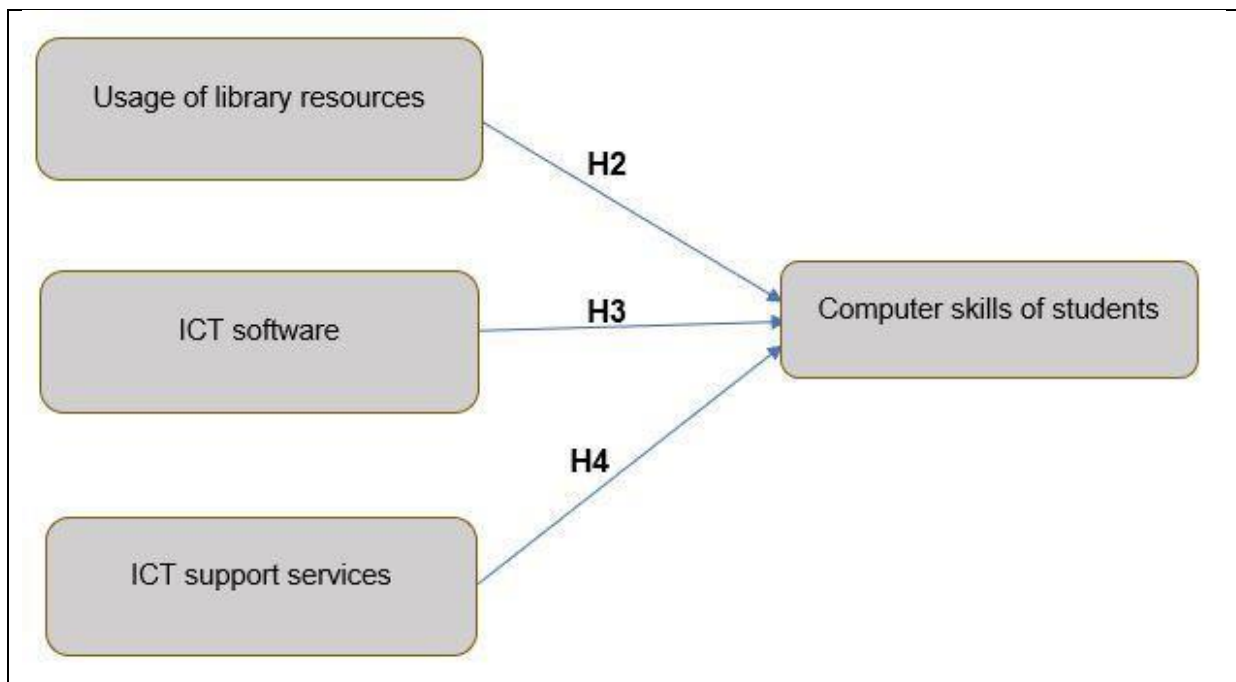


Figure 5.30: The SEM final model for computer skills of students

The SEM final model indicates the paths that have regression weights that are statistically different from zero. It can be concluded that usage of library resources, ICT software and ICT

support services have a statistically significant influence on computer skills of students. ICT software and ICT support services have a positive influence on computer skills of students.

5.9 SEM for determinants of information-seeking behaviour

The conceptual model for effect of usage of ICT resources, library resources, support services, software and computer skills on students' informative seeking behaviour is given in Figure 5.30.

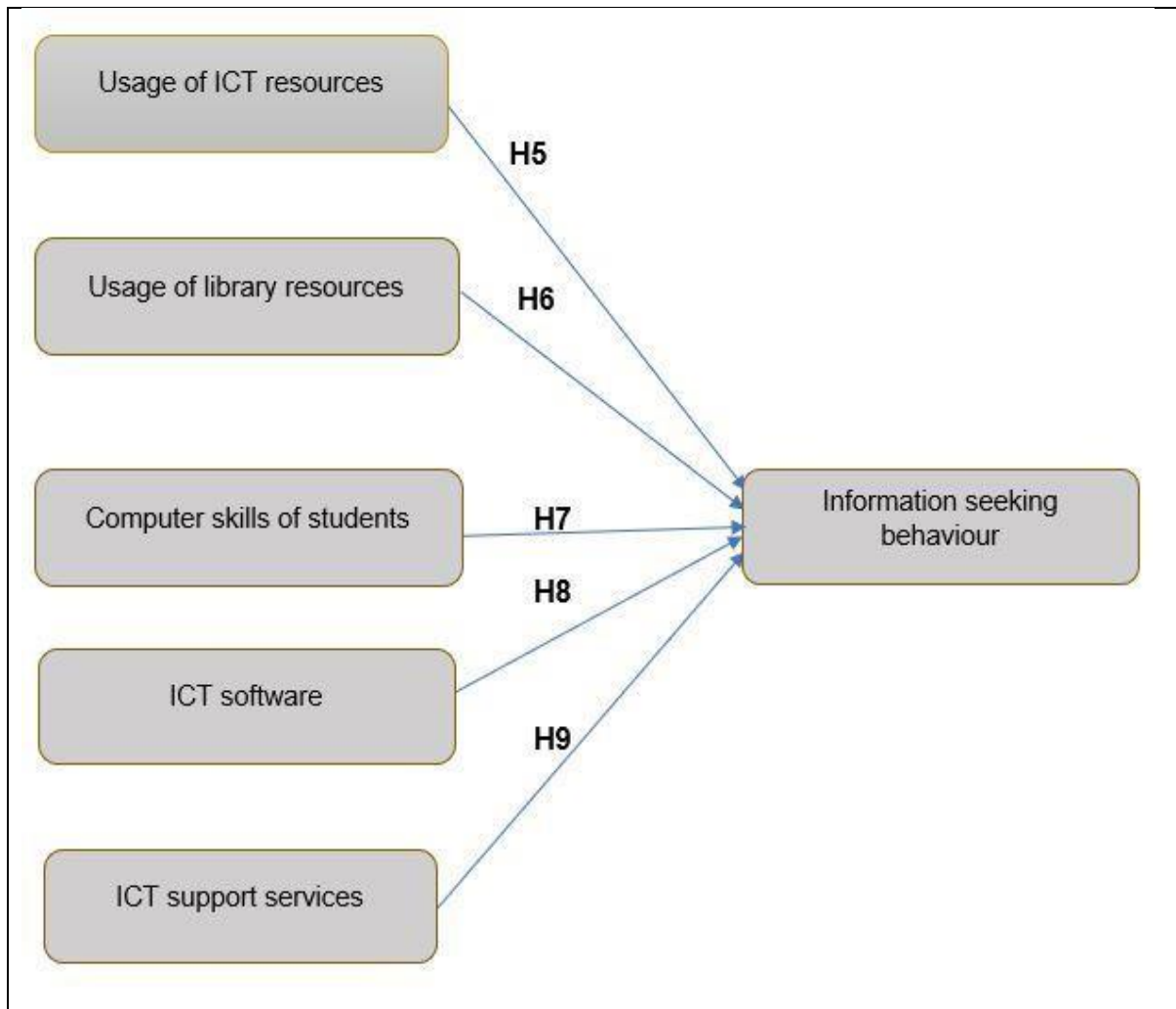


Figure 5.31: The study conceptual model predicting information-seeking behaviour

The maximum likelihood (ML) estimation method was used to assess both the measurement model and the structural model, and the models are discussed in the next sub-sections.

5.9.1 Confirmatory factor analysis (CFA) of the model

For the second model, a confirmatory factor analysis was done using the following constructs:

- Usage of ICT resources (MSIF);
- Usage of library resources (ICTSS);
- ICT software (UAS);
- ICT support services (SS);
- Computer skills of students (CS); and
- Information-seeking behaviour (PESQE).

The second confirmatory factor analysis model is given in Figure 5.31 below.

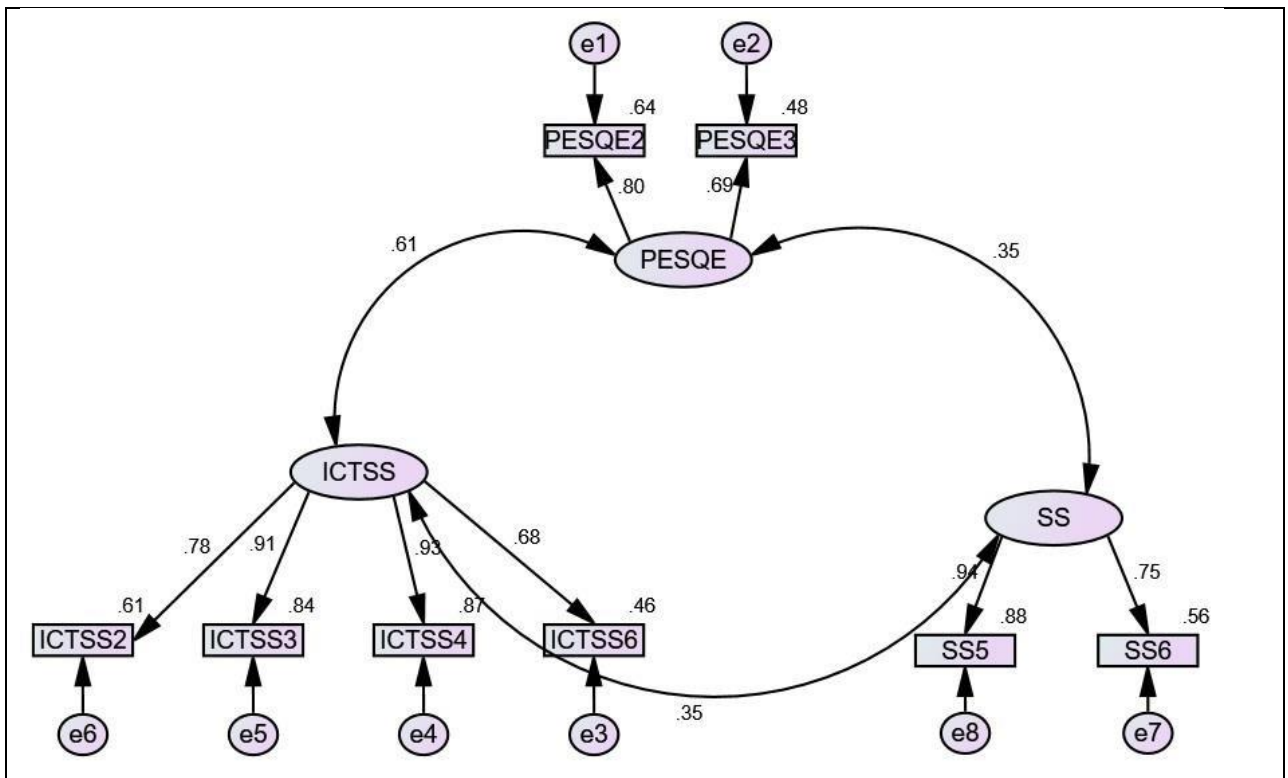


Figure 5.32: Confirmatory factor analysis model for information-seeking behaviour

All standardised loading estimates were at least .5 and the construct on the usage of ICT resources (MSIF), ICT software (UAS); and Computer skills of students (CS) was dropped from the analysis in order to achieve model fitness. The summary fit measures of the confirmatory factor analysis model on information-seeking behaviour are given in Table 5.55.

Table 5.55: Summary model fit measures for CFA model for information-seeking behaviour

Measure	Estimate	Threshold	Interpretation
CMIN	130.010	--	--
DF	17.000	--	--
CMIN/DF	7.648	Between 1 and 3	Not acceptable
CFI	.926	>.95	Acceptable
SRMR	.055	<.08	Excellent
NFI	.916	<.06	Acceptable
IFI	.926	>.05	Acceptable

The measurement model results showed that the chi-squared (χ^2) value was 130.010 with 17 degrees of freedom resulting in a CMIN/DF value of 7.648 which is regarded as unacceptable since it is above 5. However, the CFI, NFI and IFI were .926, .916 and .926 respectively which are acceptable. The SRMR was .055 and is regarded as excellent. According to Hair et al. (2019) typically, using three to four fit indices provides adequate evidence of model fit and using these criteria the model was regarded as acceptable and was tested for construct validity.

5.9.2 Construct validity of the CFA model for information-seeking behaviour

Construct validity was measured by assessing nomological validity, convergent validity and discriminant validity.

a) Nomological validity of the CFA model for information-seeking behaviour The Pearson correlation coefficients are given in Table 5.56.

Table 5.56: Correlation between variables for the model for information-seeking behaviour

Item	ICTSS	SS	PESQE
Usage of library resources (ICTSS)	-		
ICT support services (SS)	.320 ^{a**}	-	
Information-seeking behaviour (PESQE)	.493 ^{**}	.267 ^{**}	-
* $p < .05$ statistically significant; ** $p < .01$ statistically highly significant			
^a $r > .3$ statistically significant (medium effect); ^b $r > .5$ statistically significant (large effect)			

Information-seeking behaviour (PESQE) had statistically significant positive correlation with usage of library resources ($r = .493$; $p < .001$) and ICT support services ($r = .267$; $p < .001$) and. The correlations were of medium and low effect respectively. High values in information-seeking behaviour are associated with high values in the usage of library resources and ICT support services and the usage of library resources (ICTSS) had a statistically significant positive relationship with ICT support services ($r = .320$; $p < .001$). The correlations were of medium effect. High values in the usage of library resources are associated with high values in ICT support services. The constructs in the measurement theory have correlations that make sense.

b) Convergent validity of the CFA model for information-seeking behaviour

Construct reliability or composite reliability (CR) and Average Variance Extracted (AVE) are given in Table 5.57.

Table 5.57: Standardised loadings, construct reliability and AVE for CFA model for information-seeking behaviour

Construct	Item	Standard loading	Construct Reliability (CR)	Average Variance Extracted (AVE)
ICT support services (SS)	SS5	.938	.837	.722
	SS6	.752		

Construct	Item	Standard loading	Construct Reliability (CR)	Average Variance Extracted (AVE)
Usage of library resources (ICTSS)	ICTSS2	.780	.899	.692
	ICTSS3	.915		
	ICTSS4	.930		
	ICTSS6	.678		
Information seeking behaviour (PESQE)	PESQE2	.798	.715	.557
	PESQE3	.691		

Composite reliability was accurately measured for all the constructs because they have a score greater than .7. The AVE scores show that all the constructs accurately and significantly measured convergent validity ($AVE > .5$).

c) Discriminant validity of the CFA model for information-seeking behaviour

The results of discriminant validity are presented in Table 5.58 where the square root of AVE on the diagonal of the matrix, the squared inter-construct correlations (SICs) are in the top half and the inter-construct correlations are in the bottom half.

Table 5.58: AVE, MSV, Inter-construct correlations and Squared Inter-construct correlations (SICs) CFA model for information-seeking behaviour

Construct	AVE	MSV	1 (SS)	2 (ICTSS)	3 (PESQE)
1. ICT support services (SS)	.837	.125	.850	.121	.125
Usage of library resources (ICTSS)	.899	.378	.348***	.832	.378
Information-seeking behaviour (PESQE)	.715	.378	.353***	.615***	.746

Construct	AVE	MSV	1 (SS)	2 (ICTSS)	3 (PESQE)
† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$					

The square root of the AVEs are more than the corresponding inter-construct correlations and all the AVEs are more than the Squared Inter-construct Correlations (SICs) and thus discriminant validity was achieved.

5.9.3 Structural equation model for information-seeking behaviour

The same goodness of fit statistics used in the CFA was used to assess the structural equation model and the structural model obtained is given in Figure 5.32.

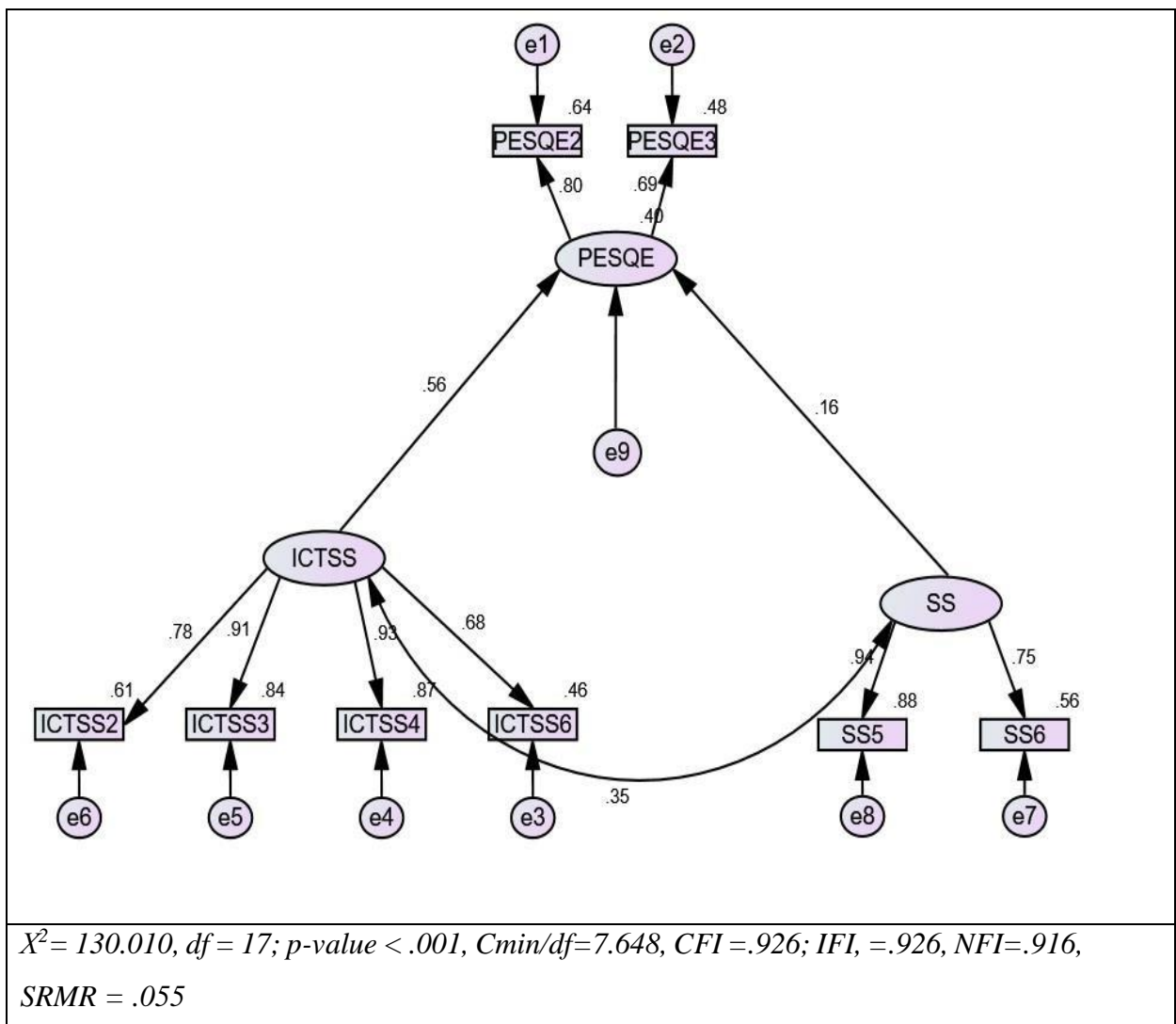


Figure 5.33: The Structural Equation Model for information-seeking behaviour

The model fit measures for the second SEM model are presented in Table 5.59.

Table 5.59: Model fit measures for the SEM model for information-seeking behaviour

Measure	Estimate	Threshold	Interpretation
CMIN	130.010	-	-
DF	17.000	-	-
CMIN/DF	7.648	Between 1 and 3	Not acceptable
CFI	.926	> .95	Acceptable
SRMR	.055	< .08	Excellent
IFI	.926	>.95	Acceptable
Measure	Estimate	Threshold	Interpretation
NFI	.916	>.95	Acceptable

The structural model results were the same as the measurement model and the model was regarded as acceptable and the path estimates model and the significance of the paths are given in Table 5.60.

Table 5.60: The standardised and unstandardised regression weights from the SEM model for information-seeking behaviour

Hypothesis	Path Name	Standardised Estimate parameter	Estimate	S.E	CR	P
H6	PESQE ← ICTSS	.559	.528	.068	7.728	***
H9	PESQE ← SS	.158	.134	.053	2.537	**
	PESQE2 ← PESQE	.798	1.000			
	PESQE3 ← PESQE	.691	.674	.077	8.797	***
	ICTSS6 ← ICTSS	.678	1.000			
	ICTSS4 ← ICTSS	.930	1.267	.083	15.233	***
	ICTSS3 ← ICTSS	.915	1.236	.082	15.077	***
	ICTSS2 ← ICTSS	.780	1.040	.079	13.185	***
	SS6 ← SS	.752	1.000			

Hypothesis	Path Name	Standardised Estimate parameter	Estimate	S.E	CR	P
	SS5← SS	.938	1.293	.180	7.170	***
*** p<.001, 0.001<p <.05						

The significant paths of the conceptual model on computer skills of students are PESQE (Information-seeking behaviour) ← ICTSS (Usage of library resources) and PESQE (information-seeking behaviour) ← SS (ICT support services) with p-values of less than .001 and .011 respectively leading to the rejection of the null hypothesis $H_0: \beta = 0$. All the paths, that is, PESQE ← ICTSS ($CR=7.728, p < .001$) and PESQE ← SS ($CR = 2.537, p = .011$) were statistically significant with p-values less than .05. Usage of library resources and ICT support services had a positive influence on information-seeking behaviour. The construct on the usage of ICT resources (MSIF), computer skills of students (CS) and ICT software (UAS) were dropped from the analysis since exclusion improved the fit of the model and thus, hypotheses H₅, H₇ and H₈ were not tested. The hypotheses interpretations are presented in the following paragraphs.

H₅: There is a relationship between usage of ICT resources and information-seeking behaviour
Usage of ICT resources was excluded from the model since its inclusion resulted in the model being a poor fit. The hypothesis was not tested.

H₆: There is a relationship between usage of library resources and information-seeking behaviour

Usage of library resources at UCC is a significant positive predictor of information-seeking behaviour ($\beta = .528; CR = 7.728; p < .001$) leading to the non-rejection of the null hypothesis of no relationship ($H_0: \beta = 0$) at the 1% level of significance. For every increase of one unit in scores for the usage of library resources by students at UCC, scores for information-seeking behaviour, increases by .528. This implies the usage of library resources by students at UCC improves the information-seeking behaviour of students and thus, such contribution is because of the scientific interactions among the indicators considered in the model and not just by chance. The hypothesis is supported.

H₇: There is a relationship between computer skills of students and information-seeking behaviour

Computer skills of students were excluded from the model since its inclusion resulted in the model being a poor fit. The hypothesis was not tested.

H₈: There is a relationship between ICT software and information-seeking behaviour ICT software was excluded from the model since its inclusion resulted in the model being a poor fit. The hypothesis was not tested.

H₉: There is a relationship between ICT support services and information-seeking behaviour
The study shows ICT support services in the university is a significant positive predictor of information-seeking behaviour ($\beta = .134$, $CR = 2.537$, $p = .011$) at the 1% level of significance resulting in the rejection of the null hypothesis of no relationship ($H_0: \beta = 0$).

For every increase of one unit in scores of ICT support services at UCC, scores for information-seeking behaviour, increases by .134. This implies ICT support services at UCC improve the quest to improve information-seeking behaviour of students and thus, such contribution is because of the scientific interactions among the indicators considered in the model and not just by chance. The hypothesis is supported.

Table 5.61: The result of the hypothesis for the SEM model for information-seeking behaviour

Hypothesis	Construct	Path	Construct	Unstandardised estimate (β)	p-value	Result of hypothesis
H ₅	PESQE	<---	MSIF			Not tested
H ₆	PESQE	<---	ICTSS	.528	$p < .001$	Reject null hypothesis at $\alpha = .05$
H ₇	PESQE	<---	CS			Not tested
H ₈	PESQE	<---	UAS			Not tested
H ₉	PESQE	<---	SS	.134	$p = .011$	Reject null hypothesis at $\alpha = .05$

The hypotheses are summarised in Table 5.61.

Only two of the tested hypotheses were significant. The result shows that usage of library resources and ICT support services impact positively on the software. The summarised decisions of the model are given in Table 5.62.

Table 5.62: Overall hypothesis testing results for information-seeking behaviour

Hypothesis	Result
<i>H₅: There is a relationship between usage of ICT resources and information-seeking behaviour</i>	Not tested
<i>H₆: There is a relationship between usage of library resources and information-seeking behaviour.</i>	Supported
Hypothesis	Result
<i>H₇: There is a relationship between computer skills of students and information-seeking behaviour</i>	Not tested
<i>H₈: There is a relationship between ICT software and information-seeking behaviour</i>	Not tested
<i>H₉: There is a relationship between ICT support services and information-seeking behaviour</i>	Supported

The research hypotheses that were supported by the analysis were H₆ and H₉ and were indicating that they influence information-seeking behaviour of students. H₅, H₇ and H₈ were not tested and the final model showing the significant paths is given in Figure 5.33.

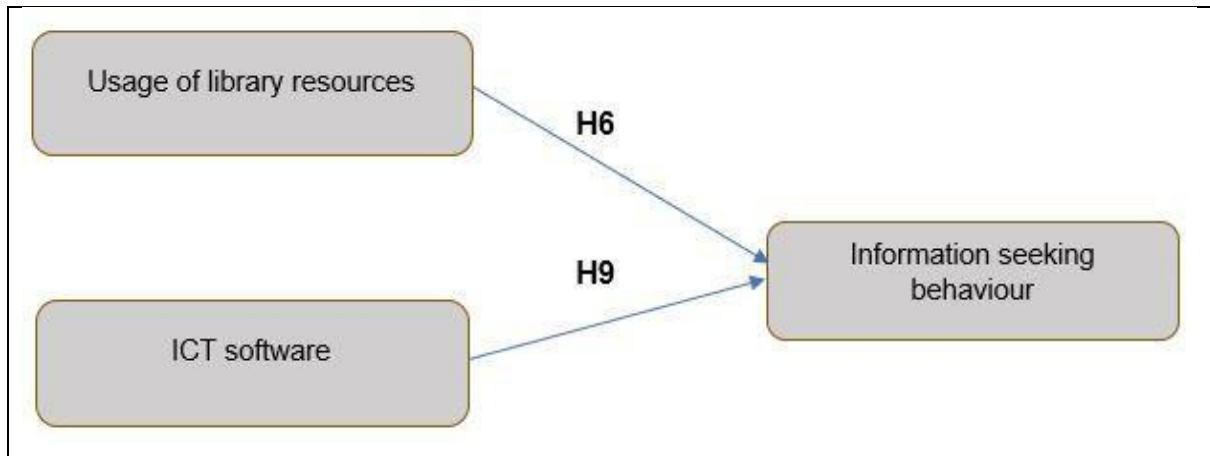


Figure 5.34: The SEM final model for information-seeking behaviour of students

The SEM final model indicates the path that has regression weights that are statistically different from zero. It can be concluded that usage of library resources and ICT support services have a statistically significant influence on information-seeking behaviour. Usage of library resources and ICT support services has a positive influence on information-seeking behaviour.

5.10 Qualitative findings

According to the librarians, Internet, lecture notes and handouts, textbooks, thesis and dissertations and electronic journals were mentioned as the most sought-after information (library) resources.

5.10.1 Findings from interviews conducted with librarians

The study also used semi-structured interviews to solicit information from librarians. This was done to compliment the possible weakness in the quantitative study. In all five librarians were interviewed at an approximated time of 30 minutes. The questions on the interview guide were based on the research objectives of the study. Detailed sample of the interview guide is at the appendix section. Subsequent sections elaborate on the findings from the interview with the librarians.

5.10.1.1 Information needs and types of information resources utilised by the undergraduate students

According to the librarians, Internet, lecture notes and handouts, textbooks, thesis and dissertations and electronic journals were mentioned as the most sought-after information (library) resources by the undergraduate students. The interviewees were of the view that students were mostly chasing after academic information. For instance, librarian A said, *“though students are sometimes seen searching for information for personal and other purpose other than academic, but the latter remains a main type of information they look for almost every day”*. In accord, librarian B mentioned, *“Most of the students ask me for help in searching for suggested reference materials from their lecturers.”* Librarian C added, *“I have realised that most students normally search for academic information during the early periods of the times they spend in the library, and once they are done, they enthusiastically move on to searching for information for other purposes, most often from computers and mobile phones”*. On the other hand, librarian D stated, *“I see most of the students searching for information for their assignments, term papers and project works.”* Another librarian, librarian E opined, *“I have observed that majority of students who visit the library do so in pursuit of academic information against pending examination and quizzes.”*

This possibly points to the fact that academic information remains as prominent among types of information students search for in regard to their course of study. Also, the librarians said that they had noted that students mostly use electronic media for information. For instance, librarian C iterated, *“as I mentioned earlier, most students nowadays are more used to electronic form of information and this remains inevitable because of technological advancement in this 21st century”*. Obviously, this could be ascribed to a possible reason (the fun and convenience in the use of ICT) to librarian C’s earlier assertion about students’ enthusiastic search for information for other purposes. In accordance, librarian A said, *“I have observed that quite a number of students who visit the library do not use library materials like books but all they do is access information from the internet through their cell phones and lap top computers in addition to ones they access from the library’s electronic data base.”* In agreement, another view from librarian E was, *“A student once told me that after his first year on campus, he never visited the university library till he was in his final year, all because he preferred using the ICT resources for information than accessing information from books, journals and so on”*.

The data strongly show that, among other sources of academic information at the institution, the internet is the most important. Electronic format sorts of information have the same level of appeal. Access to scholarly information resources for academic work, collections management, book/material lending, reference and information services, questions and answers service, selective dissemination of information, current awareness service, information literacy instructions, learning and research support, electronic support (computers, photocopying, Internet, scanning, printing, etc.), and advisory services on scholarly information were among the library services mentioned by librarians. The findings support that of Marchionini (2019).

5.10.1.2 Strategies employed by undergraduate education students in seeking information resources at UCC

The findings showed that students explored more of the electronic support systems rather than the tangible manual system of information. For instance, librarian E stressed, *“One observation I have made about students is that they tend to visit the library more often when they are in academic levels of 100 and 200 than in 300 and 400”*. Accordingly, librarian B asserted, *“Opportunity I have had to dialogue with some of the level 400 students revealed that they find the information from Internet more updated and easier to process than that in the library.”* In the same vein, librarian D said, *“Students normally access the electronic support unit to photocopy and scan documents most of which are notes of colleagues, lecture notes and other lecture materials”*.

The findings also indicated to some extent the limited use of IT software applications by students. In other words, students are not challenging themselves with the use of more complex software. *“An observation, I have made have to do with their IT skills; most often students are seen to be using the word processing, Power Point application and internet application software on the computers whether personal computers or that from electronic support unit”* [librarian D]. Similarly, librarian A mentioned, *“I have observed that most students use the internet to obtain academic and personal information through search engines like google, e-mails and other media applications such as WhatsApp, Twitter and Instagram”*.

The norm of presenting assignments in hard prints to lecturers makes the use of popular software like MS-word application by these students inevitable. In tandem, Angie said, *“Most students*

normally type and print assignments and term papers in MS-word format". The findings to this question indicate students' increased preference for electronic support systems compared to the tangible manual system of information. This suggests the need for improving the manual support system to make its use more beneficial.

5.10.1.3 Efficiency of UCC's ICT resources to promote sound learning and research work in students

The findings indicated that the library resources are inadequate while internet connectivity is also inconsistent at UCC. For instance, librarian E said, *"Some students especially Level 100 and 200 students normally complain about limited availability of library materials such as textbooks"*. This is a possible indication that students of lower levels seem to be frustrated more about the inadequacy of library materials. Also, the findings suggested that Internet usage is more frustrating for the students. For example, librarian D put it this way: *"We often receive a number of complaints from students about the Wi-Fi system not functioning properly and therefore making their search for information frustrating"*. However, librarian D said, *"Generally, the UCC IT laboratory is good in terms of its accessibility"*. In harmony, librarian B raised the concern, *"Current number of computers and other accessories has remained fairly inadequate to meet the needs of students over the years."*

The librarians' views on the assistance they provide students in their search for information indicated that, generally, they did their best to resolve the problems that students encountered. However, they also raised a number of issues suggesting that they were not to blame for students' dissatisfaction about the level of assistance they give them. For instance, librarian D complained, *"some students think they know too much so they do not consult us when they encounter problems whenever they are accessing information resources; they end up either frustrated or causing damage to some electronic equipment in the library..."*. Yet another complaint was raised as follows: *"... Some students are rude by way of their speech and this sometimes, I believe demotivate some librarians to do their best in extending a helping hand to students during their such for information but having said that, we have no choice but to assist anyway, that's our job"* [librarian B]. Librarian A also mentioned... *"Significant number of students also lacks the confidence to ask for assistance; some are extremely shy and so until a librarian observe that such students need assistance and provide some, the student will continue in confusion and subsequently leave the library disappointed."*

Per the participants' views, various assistance given by the IT laboratory staff to the students were found to be the rectification of software errors and hardware problems, assistance in the printing of documents, downloading information, photocopying, information search on the Internet. In their evaluation of the usability of the library resources, all the librarians thought that generally, the study materials in the UCC library were fairly adequate for effective studies or research. As such, they emphasised instances of deficiencies in the usage of the resources. For instance, librarian A said, *"resources in the library okay but as it stands it is gradually failing to meet the growing population of students each year due to damages and losses"*. In concord, librarian E noted, *"There have been several instances where students come to search for particular types of books and don't find it even with my assistance"*. On a follow up on this issue, librarian E disclosed, *"key among reasons given by students who fail to return books they borrow from the library points to the fact that the books aren't enough in the system and therefore fear that upon return they might never gain access to it again"*. In line with this, librarian D stated his observation, *"I have realised that some limited library books are borrowed over and over again by the same students"*. On the other hand, and in harmony with librarian A, librarian B raised a complaint, *"re stocking of library materials is not adequate as significant numbers of the library books are outdated and partly damaged, making them unattractive"*.

Also, most of the views on the accessibility of the library system indicated that generally, the library services provided to students are highly accessible. As reflected by librarian C comment, *"The library always receives uncountable numbers of students daily with most of them leaving with their needs either met halfway or fully"*. Compatibly, librarian A mentioned, *"There have been only a few occasions in a year when I couldn't meet students need when they consulted me for assistance, aside that I am convinced that most of their needs are met through the library services provided."* Another opinion read as follows: *"Not bad, the library system has always functioned to serve well a large populace of students' year by year with their academic needs"* [librarian B]. Likewise, librarian E simply put it: *"The library system over here is quite friendly to its users especially students"*. Quite the reverse, librarian D's thought seemed to suggest that the library's system was good but fairly met student's needs: *"Yearly, I come across significant numbers of students who are one way or the other frustrated by the time they are done with their mission at the library and about to leave"* [librarian D].

Generally, all the views obtained emphasised that IT services provided by the library had impacted positively on students search for information. As librarian A happily put it, *“I am proud to say of a student friend now in level 400 who very often consulted me with software errors often during his early years on campus, but he scarcely does that now as he is able to solve those problems himself”*. In harmony, librarian E added, *“I have observed that most students who successfully go through user education such as information literacy skills organised by the library management hardly request for assistance with respect to software applications or errors.”* Librarian D emphasised, *“Students are not affected by closure times of IT laboratory due to Wi-Fi connection as they can comfortably access the internet on the personal computers and phones within their comfort zones within the UCC’s Wi-Fi zones”*. Others talked of the advantage of the convenience of handling data: *“The student access to electronic information makes it easier for them to carry loads of information effortlessly, for instance, voluminous data stored on pen drives could be a burden to be carried in hard prints”* [librarian B]. Librarian C added, *“Communication between lecturers and students on academic issues have been enhanced by way of interaction on the internet through email, WhatsApp and so on.”*

5.10.1.4 Strategies for satisfying information needs and seeking behaviour of the undergraduate students at UCC to promote sound learning and research work

The information gathered from participants about the strategies in place for satisfying information needs and seeking behaviour of the students to promote sound studies revealed some accomplishments by the library management. A significant attempt captured from their views had to do with the creation of an enhanced technological space for post graduate students, which to some extent could ease the pressure on limited information resources at UCC.

Librarian B asserted, *“The library has provided an enhanced technological space for post graduate students with maximum sitting capacity of 250 people.”* It was realised that enhanced technological space will provide students with the necessary environment to do research work. Their views also brought to light managements’ achievement of beefing up electronic information resources and support unit. Similarly, librarian D said, *“Management has subscribed for over 43 academic databases to support teaching and research activities of the students by which most of the materials can be found electronically.”* Librarian D mentioned, *“there is the electronic support unit which receives requests from students who are too busy to*

search for information by assisting them.” This helps students by providing them with online assistance even when they are remote from the library.

Another significant achievement per the participants’ views had to do with management increasing the time for accessing library services. Librarian B said, *“The library management has made provision for extended library services after the normal working hours which is in the morning from 9:00am – 4:30pm. This continues in the afternoon from 4:30pm to 10:00pm and during examination periods library services are further extended from 10:00pm to 5:00am in the morning.”* A follow up question about the sustenance of the extension of time attracted another comment indicating that the measures had been put in place to curb the unstable power supply to enhance the use of the UCC library, as librarian B indicated, *“A standby generator has been put in place to curb the issue of power outage (unstable power supply) which negatively affects the use of the UCC library.”*

Achievement with regard to promoting sound learning and research work was also observed. Librarian D said, *“students are being train to have requisite skills to access and use library resources effectively through user education (orientation, information literacy skills) from the library management.”* Some suggestions came from the interviewees about the strategies for satisfying information needs and seeking behaviour of the students to promote sound learning and research work. For instance, librarian D stated: *“The IT laboratory space should be enlarged and supplied with more IT resources to promote high accessibility of its resources respectively. The level of automation of the school’s library should be improved to increase the rate of its utilization.”* Librarian E suggested the update of library materials as follows: *“The library should be supplied with more current library materials to promote high accessibility of same”*.

Most of the participants interviewed also emphasized on the need for other reliable source of energy (electricity) to run IT equipment. For instance, librarian A said, *“Solar power would do better as a reliable source of energy to complement the universities power plant which is sometimes malfunctioning or overstretched in its utilisation”*. In the same vein, librarian C stressed, *“The government should address seriously the issues of the erratic electricity power supply as this was the most mention challenge by the students as a barrier to the use of ICT in*

the institution". Similarly, librarian B recommended that Management of UCC IT laboratory should implement strategies that would help curtail the problems of unstable power supply. Suggestions presented so far implies that governments at all levels should make ICT a matter of priority; improve the funds specifically needed for the training of students in computer education in order to improve their ICT knowledge and research work in various schools.

5.10.2 Findings from interviews with students

The study also used semi-structured interviews to solicit information from students. This was done to compliment the possible weakness in the quantitative study. In all five students were interviewed at an approximated time of 30 minutes. The questions in the interview guide were based on the research objectives of the study. Samples of the interview transcripts are appended at the end of this thesis. Subsequent sections elaborate on the findings from the interview with the librarians.

5.10.2.1 Information needs and types of information resources utilised by the undergraduate students

The following were mentioned as the most sought-after information (library) resources by the undergraduate students: Internet, textbooks, thesis and dissertations and journals, electronic journals etc. This is evident from their views, to highlight a few, student J said, *"I usually get information from the internet, books and journals"*. In tandem, student G mentioned, *"In fact, the internet has been useful; I get information almost all for my assignment from the internet, textbooks and lecture notes"*. More so, student D also added, *"Occasionally, I access information from hard print thesis and e-journals for my term papers"*. The findings possibly suggest that students are attracted more to electronic forms of information more than those in hard prints. However, the findings also suggest that students access various library services available at UCC, for instance, *"I normally consult librarians with challenges of book referencing, journal etc. at the library"* [student J]; *"At the library, I normally do scanning and photocopying of documents"* [student G]; *"I get access to theses, journals and other scholarly materials at the library"* [student F]; *"I do borrow books often from the library"* [student C]; *"I enjoy accessing the electronic data base system of the library for information"* [student J]; *"I sometimes consult librarians on selection of suitable text books and other informative materials for my assignments"* [student D]; *"I do all my print outs of assignments at the electronic"*

department of the library and hope to do a print out of my final draft of dissertation too at the same place; their services are good and very affordable” [student F].

There was therefore an indication that the automation of the UCC library had to some extent proved to be useful to students as far as information retrieval is concerned. For ease of discussion, similar library services named by students were grouped under ten categories of library services. These included book/material lending, reference and information services, questions and answers service, current awareness service-learning and research support, electronic support (computers, photocopying, Internet, scanning, printing, etc.), advisory services on scholarly communication, intellectual property, open access, institutional repository, etc., bindery service and digitization service. The findings portray those students are aware of most of the library services. It could be confidently assumed that they also access and or patronises these services accordingly.

5.10.2.2 Strategies employed by undergraduate education students in seeking information resources at UCC

Most views from the students about the strategies that they employed in seeking information resources from students indicated that they normally accessed the electronic support unit to access the internet and UCC database, do photocopy and scan documents. Their views also suggested that mostly software that they use are Microsoft Word, PDF and PowerPoint applications. For instance, student J said, *“We are normally asked by lecturers to present assignments in MS word format”*. Likewise, student G added *“Most lecturers ask that we convert our term papers in MS word format to PDF prior to submission”*. These views indicate that the power point application software was mostly used for presentation of dissertations and term papers. Student D mentioned: *“Most of our group assignments are presented orally together with application of power point software”*. Similarly, student F added: *“We normally defend our dissertations through the use of ppt application software”*. Their views seem to suggest that there is much demand from lecturers for consultation on variety of information sources. They implied that presenting in PowerPoints is complimented by searching information on the internet and reading through library material. Without these searches for information, students cannot develop good PowerPoint presentations.

Per the students' views, the most common search engine they apply on the internet to seek information is the google search engine even though they also used Bing, yahoo and ask.com. For instance, student F's view read, *"I normally use Google to search for information; it is simple to manipulate, and I have observed that it gives vast range of search results"*. Another view, *"Though I use the search engines, Bing and Ask.com occasionally, Google remains my favourite"* [student J]. Student G added, *"I normally use Yahoo and Google search engines to search for information"*. Evident from these participants' views is that other media applications such as WhatsApp and Gmail were also mentioned as applications that have been helpful in the search for information. student F said, *"I have benefited so much from academic WhatsApp platforms that I joined a couple of years back on campus; I sometimes receive useful academic information for my assignments through this medium"*. This view, together with others, confirms the growing popularity of collegial discussions on UCC campus as noted in earlier sections of this chapter. The finding also points to the fact that the WhatsApp application has been successfully used by students to enhance studies. In that, discussion on WhatsApp platforms do not have to necessarily involve group members converging at a location to discuss academic issues but rather from their comfort zones. For instance, student J mentioned, *"I normally join my study group to do group discussions on our WhatsApp platform, where I gain more understanding on lectures notes acquired"*. Similarly, student D added, *"Sometimes I receive useful academic information from colleagues in other universities that complement the information that is lacking on campus through my email and WhatsApp accounts on my cell phone or laptop"*.

The views so far suggest how technological advancement is making the transfer of information and retrieval of same more convenient with time. Hence, the essence of information technology devices such as computers and cell phones in these modern times, so far as information-seeking is concerned. While these devices are important, other accessories like printers, photocopiers and scanners also remain very essential as prior to binding services, materials for binding are mostly subjected to one or more of the operations of the aforementioned devices. Participants' views indicated that the students also normally print, scan and bind documents at the library. For instance, student G stated, *"I normally photocopy and as well bind past examination and quizzes materials"*. Student D mentioned, *"I normally scan pages of books that are not for borrowing at the electronic section of the library and upload to my cell phone or laptop"*.

5.10.2.3 Efficiency of UCC's ICT resources to students with respect to promoting sound learning and research work

The findings brought to the fore a number of challenges faced by the students in their usage of library resources and services. Some of these had to do with the difficulty in getting access to recommended references from their lecturers. For instance, student C mentioned, *“we do not always get references, that is books that our lecturers recommend that we obtain from the library for our assignments, quizzes and exams”*. Comparing favourably, student D added, *“Management needs to beef up availability of library materials to enhance our studies”*. Ideas can be drawn from these two instances that the UCC library lack materials that are of students' interest. Other challenges had to do with usage of the internet. Student F complained: *“Sometimes using the Wi-Fi system becomes very frustrating as it sometimes does not function properly, so, I visit the internet café a lot”*. A key recommendation from views obtained was on the adequacy of IT resources: *“I think the number of computers and other accessories such as printers, photocopiers and scanners have to be increased to meet the ever-increasing student population as there are times when we have to wait in cues for long periods of time before we could use them”* [student G].

However, significant number of the participants deemed the ICT laboratory better in terms of its accessibility than the library facility. For example, as put by one student, out of other similar opinions, *“Generally, the UCC IT laboratory is good in terms of its accessibility”* [student J]. Generally, participants were of the view that librarians are very responsive to their request for assistance. For instance, student G claimed: *“I like the way they heartily assist me in searching for books and other informative materials in the library”*. Another compliment in this sense was from student F as follows: *“I am okay with the assistance I receive from them; it gets me motivated to keep visiting the library.”*

Majority of the participants shared two key common opinions in their evaluation on state of library system and resources, its usability of same namely quality and adequacy of the information in books shelved at the library. For instance, student J's assertion, *“some textbooks are not current though provide useful information and some inadequate per their numbers”*. In concord, student H noted, *“the library should be stuffed with more books to prevent some of our colleagues from hijacking some of the books in their rooms”*. On the other hand, a few comments highlighted the positive impact of the library as follows: student G mentioned, *“The*

serenity of the library helps me to concentrate during research and studies". Student J opined in harmony with student G, *"The library to some extent has been useful in my search for information"*. In addition, student F, in his evaluation of the library system, said: *"The library system is not bad at all, but needs regular monitoring and maintenance to enhance information search"*.

Others emphasised the essence of current efforts by management to increase automation level of the library. For instance, student J said, *"availability of computers and other accessories like photocopier, scanners and so on reduces the burden of processing and transportation of information obtained in the library"*. Also, in tandem with student J, student H put it thus: *"The library system can't be any better without a completely merging with the ICT department because most of us students in this technological age can't do without ICT in all we do"*.

Generally, the views indicated that the library, though functioning, was not so much above average. Another indication points towards the essence of incorporating the ICT resources in the system. Generally, the participants' views pertaining to the IT services provided by the library system indicate the problem of the unsociable nature of librarians and how it negatively affects their search for information, while the other few opinions were indecisive on the services of the IT staff. In line with this, student J said, *"A couple of IT staffs have been rude towards me and so it discourages me from visiting the IT laboratory whenever it comes to mind."* Likewise, student H added: *"The IT staff aren't so welcoming; I find it difficult to call for their assistance whenever I'm stuck by the computer."*

Commonly, the students' views indicate that students were not sure that the assistance from IT staff was or was not satisfactory. Some statements which support this are: *"I can't really tell"* [student G], *"Well, somewhat okay"* [student D] and *"Their services are somehow okay"* [student F] and so on. However, opinions from a couple of students suggest that the assisting roles of the librarians are considered insignificant in as far as their (students) information-seeking behaviour is concerned.

For instance, student J said, *"I am very good at manipulating electronic information resources than the hard prints so don't really bother to consult any IT staff whenever I encounter software problems"*. An indication of more independence on librarians was another significant opinion,

“I use my own Wi-Fi, Printer, Photocopier, Lap top computer and other accessories, so I hardly visit the IT laboratory” [Akosua].

Generally, participants were of the opinion that they receive less assistance from the IT laboratory compared to those at the library. There is also the possibility that generally, the library staffs’ attitude towards student could be better than that of IT staff.

5.10.2.4 Strategies for satisfying information needs and seeking behaviour of the undergraduate students at UCC to promote sound learning and research work

Participants provided a number of suggestions for curbing challenges they encounter in their use of the institution’s ICT and library resources. Major views considered that encompasses other views are: *“Library and ICT staff should be taken through training on relationship management, so they learn to relate to students better to promote sound learning”*. [Kwame]; *“The Wi-Fi system must be made more effective through effective monitoring and maintenance strategies”* [Kweku]; *“I think the number of computers and other accessories such as printers, photocopiers and scanners have to be increased to meet the ever-increasing student population ...”* [Adwoa]; *“The ICT and library space especially the ICT have to be enlarged to accommodate more students at a goal”*. [Akosua].

Key solutions to curtail the challenges faced by students in the use of UCC ICT and library resources that were identified included efficient monitoring and maintenance of ICT resources, periodic enhancement of students’ ICT skills through training, seminars for IT and library staff on how to efficiently assist students without intimidating or frustrating them and expansion of the UCC IT laboratory and library space to enhance information-search methods. Examining solutions gathered from both questionnaires and interviews, it is obvious from the findings that monitoring, and maintenance of ICT resources is lacking in the management of UCC ICT and library resources as this has been the most stated response.

The findings revealed that undergraduate students need information chiefly for academic purposes with regard to various tasks such as the writing of assignments, term papers and research projects, preparation for quizzes (class tests) and examinations, and also academic presentations. Students used both printed and online or electronic resources such as databases. A trend of students’ preference for electronic format of information resources to print materials

was observed with internet gaining most popularity as most accessed ICT resource. This can be ascribed to the lecturers' demands of type of format in which they prefer assignment to be presented.

Per the findings of the study, two groups of undergraduate students can be observed namely, the lower level (1st year and 2nd year) and higher level (3rd year and 4th year) students. Findings indicated that the former tend to visit the library more often than the latter. The higher-level students preferred using the ICT resources for information than accessing information from books, journals and so on online resources most likely due to the fact that they supply the most recent information with many conveniences. Collegial discussions alongside the internet use for information was found to be the most popular strategies employed by students in seeking for information. The implication here is the greater influence of ICT on information-seeking behaviour in our modern world compared to past years where the orthodox library system was the order of the day. Hence, the automation of the current library system of the UCC library is plausible, though could be improved to meet students' information needs.

The findings have established the need for efficient monitoring, maintenance and expansion of ICT resources of UCC IT laboratory and library to enhance information-search methods. However, there is also the need for commitment from stewards of these resources (management and staff) as they execute their duties. The findings obtained in this section to a large extent compare favourably with those of quantitative data obtained. However, the findings in this section further brought out students' emotional states attached to their information-seeking behaviour. For instance, both data forms revealed students were fond of using the ICT for information search other than the library. However, findings revealed that students who visit the library get frustrated with challenges posed by the inadequacy of library materials such as recommended textbooks by lecturers. Similarly, though findings show that though students are enthused with ICT resource use because of convenience of handling electronic data, they worriedly expressed the problem of unfriendly attitude of librarians and sometimes unstable internet connectivity which gets them frustrated. Hence, the essence of using a mixed method approaches for this current study.

5.11 Conclusion

The chapter has presented the findings on information needs and Information-seeking behaviour of undergraduate education students at UCC. The opinions of students from the various academic levels regarding the phenomenon under investigation was analysed in this regard. It presented both quantitative and qualitative data. The former was obtained through descriptive statistics such specifically frequency and percentages to help analyse data and draw findings and conclusions. Other statistical analyses included exploratory and confirmatory factor analyses, as well as structural equation modelling to examine the various variable under study. The qualitative results on the other hand were obtained by way of interviews. The findings reveal various information needs and seeking behaviour of students in popularity and patterns respectively. Challenges in the use of IT and library resources were identified and respondents' suggestions to resolve these challenges.

Per the results, academic information is the fundamental information needs of undergraduate students at UCC. Furthermore, discussion with colleagues, students and teaching assistants are information resources utilised by students. The findings also suggested that most students use ICT resources to search for information. These ICT resource include the use of computers and mobile phone internet service to search for academically relevant. From the findings, it is evident UCC students have access ICT information resources. These ICT resources available for students are adequate and effective. However, some did not find these ICT resources effective. Finally, both quantitative and qualitative findings pointed out that effective strategies that are likely to improve students' information-seeking behaviour include: continuous and periodic training of students on computer skills and good relationship between UCC IT laboratory staff among other strategies.

Chapter Six

Triangulation of findings

6.1 Introduction

This section of the study involves triangulation of the quantitative results with the qualitative results guided by the research questions of the study and as well establishing findings and a general conclusion in each instance in accordance with the empirical studies, theories, concepts. The response rate of 100% contradicts the statement underscored by Dane (1990, cited by Rahman, 2017) that a major disadvantage of the survey method relates to poor returns. A possible indication of participants' high-level enthusiasm for the study and effectiveness of data collection procedures employed by the researcher also contradicts the underscored statement. More so, the higher numbers of female respondents (63.6%) are in tandem with the current state of high rate of female participation in education in the country (Acheampong & Kayange, 2017). The results obtained could be described as rich as the quality of the responses, probing, saturation of the data. The respondents were all of youthful ages who can be categorized as highly potential information seekers and users. This is of significance to the study as the youth in our world today could be considered more enthused with technology especially in the area of information (Joshi, Stubbe, Li & Hilty, 2019).

6.2 Information needs and types of information resources utilised by students

Information need is inevitable in as far as a student's endeavour to achieve academic goals. Polatidis et. al., (2018) note that information need is the recognition that one's knowledge is inadequate to satisfy a goal that one has. This goal normally leads to a variety of approaches by students in searching for or seeking information. According to Koesten et al. (2017) and (Alhazemi, 2015 as cited by Ingwersen and Jarvelin, 2005:21), information-seeking behaviour is defined as "human information behavior concerned with searching for or seeking information using information sources and (interactive) information retrieval systems".

Typical of any higher education environment, various kinds of information that students normally sought after were found to range from Internet, lecture notes and handouts, textbooks, thesis and dissertations and electronic journals, photocopies of past questions to newspapers amongst others (refer to sections 5.9.1.1 and 5.9.2.1 of Chapter Five). The interview with

librarians and students brought to light that the students mostly use electronic media for information.

The data strongly show that, together with electronic format types of information, the internet is the most important source of academic knowledge in the institution. According to Haliso (2011), a study conducted among undergraduates by Valentine (1993) found that they (undergraduates) sought the quickest path to good findings when performing research, resulting in the decision to use electronic information sources first.

Preference for electronic information to print material at UCC Campus compares with studies by Oluwafemi, Adeniyi, Oluseun and Olatunde (2013) and Uugwanga (2017). Both studies highlighted students' preference of online resources to print material by the students as well as a common finding that students search Google for information before consulting other sources. Figure 5.2 shows that academic information remains prominent among types of information students search for in regard to their course of study is academic information. In agreement, most of the librarians interviewed asserted that students who visited the library mostly sought-after academic information. For instance, below was a librarian's observation: "*... though students are sometimes seen searching for information for personal and other purpose other than academic, but the latter remains a main type of information they look for almost every day.*" [Student B].

This could be implicated by the assumption that the students are generally serious with their academic work and or overburdened with assignments, quizzes or term papers which keep them seeking more after academic information. In concord, Chawinga and Zozie (2016), in their study, emphasised that students in higher education institutions are encumbered with many assignments and class demonstrations which required they source for information on their own in an environment that appear academically unfavourable, with regard to inadequate sources. Also, in agreement with the findings, research has established that the primary purpose for students' search for information is for their studies (Ajigboye & Tella, 2007; Uugwanga, 2017). In tandem, Onouha and Awoniyi (2011) reported that the students sought information mainly for purposes of updating their knowledge, preparing for examinations and doing assignments.

Per the findings of the study, the most popular behavioural pattern identified had to do with students' access of information through discussion with their colleagues (Table 5.3). This is supported by data in table 5.9 which highlights "discussions with colleagues" as students' common way of normally preparing for quizzes and end-of-semester examinations. A possible reason could be that lecturers normally set questions to cover what they have taught in class. Therefore, a safe way to capture most of the issues covered could be relying on opinions of colleagues who were present and also update notes should there be errors or omissions in them. Broadly, this could mean that students are better informed with academic information through discussion with their colleagues than through accessing ICT and library resources. This compares favourably with the finding of Uugwanga (2017), who reported that majority of university students rather choose to discuss with their peers to get a better understanding of the topic before they embark on any literature search. The reasons given by the participants in the current study was that their colleagues are accessible. Conversely, Fasora and Olabode (2013) reported that the library is the students' preferred place to access information. The findings suggest that UCC's undergraduate students engage in collaborative information-seeking by seeking assistance from and working together with peers. However, this drift from access of library and ICT laboratory to more of collegial discussions could be linked to challenges encountered by students when accessing these facilities. For instance, the following significant responses obtained through interview sections with the students confirms this: "*We do not always get references, that is books that our lecturers recommend that we obtain from the library for our assignments, quizzes and exams*" [Student C]. "*Management need to beef up availability of library materials to enhance our studies*" [Student D].

At the moment, there is still a limitation in terms of access to the students. The situation is so even in those universities where Internet amenities are available. "*Generally, the UCC IT laboratory is good in terms of its accessibility*" [Student E]. "*Sometimes using the Wi-Fi system becomes very frustrating as it sometimes does not function properly, so I visit the internet café a lot*" [Student F]. "*I think the number of computers and other accessories such as printers, photocopiers and scanners have to be increased to meet the ever-increasing student population as there are times when we have to wait in cues for long periods of time before we could use them*" [Student G].

Subsequently, students have no choice but to explore other sources to complement the seemingly inadequate information they obtain from the library and ICT facilities. Thus, students have no other choice than to utilize the private internet service providers commonly known as cyber cafes. In harmony, the result reveals that most of the respondents were of the view that the availability of internet resources in the UCC IT laboratory is poor (Figure 5.2). The internet among other sources of academic information was found to be the second most accessed. This was confirmed in the words of Bobby, a librarian: *“I have observed that most students use the internet to obtain academic and personal information through search engines like google, e-mails and other media applications such as WhatsApp, Twitter and Instagram”*. Confirming this is the finding presented in Tables 5.4 and 5.3, which reveals students overly dependence on internet source of information for their assignments. This may be ascribed partly to the convenience of manipulating the internet for information and also the current upsurge of internet use for almost every endeavour in these modern days. In concord, Joo and Choi (2015) asserted that the easy accessibility of online information sources is the core motivation driving students to use them, irrespective of their qualities. This finding agrees favourably with the assertion by De Wit, Heerwegh and Verhoeven (2012), that but for a link of computer to the internet, computers would not have been very important for students. In that, the internet provides a platform for students and to search for information and as well communicate with teachers and colleagues. Maharana, Biswal and Sahu (2009) observed that most students use the internet weekly for the purpose of accessing reading material recommended by their lecturers.

Though baseline observation by the researcher shows that students at UCC have access to the Internet facilities and as well, exploit these facilities for their learning. The UCC Library is rated among the best in Ghana and Africa universities in terms of size and volume. It may be hypothesised that students actually find it easier to locate materials on the internet than searching through the library, a task which may seem arduous. The use of the internet by a majority of the students per this study is conflicts with the findings of Fidzani (1998), that there was a heavy dependence on library books and journals. This conceivably depicts that UCC has advanced positively from the traditional library reliant University to the more cybernetic library-based University. It may also be logical that perhaps, suitable library education programme needs to be put in place to help the students further in accessing library information. The expectation is that when students are fully informed about the benefits of the libraries, they will make use of them more. Ajiboye and Tella (2007) further noted that this apparently

increasing reliance on the Internet by undergraduate students in an African university therefore calls for crucial actions in the provision of the facilities.

6.3 Efficiency of ICT resources in promoting sound learning and research work

The adoption and use of ICTs in education have been reported severally to having a positive impact on learning and research. ICTs can enhance the quality of education by increasing learner motivation and engagement (Noor-Ul-Amin, 2013). Inferring from results, it could be said that Information in the UCC IT laboratory is accessible to students (Table 5.10). On the contrary, problems such as restricted access to internet and insufficient ICT resources like computers, printers, photocopiers and scanners and so on, were mentioned as possible reasons for less access of library and ICT facilities compared to collegial discussions. This compares favourably with the fact that most students think the present status of UCC IT laboratory services is good but could be improved to enhance information-seeking (Table 5.12). Further deductions from results shows that ICT resources is fairly adequate for satisfaction of students with respect to effective studies or research (Table 5.10).

ICTs can enhance the quality of education in several ways by facilitating the acquisition of basic skills (Aktaruzzaman, Shamim & Clement, 2011). ICTs, especially computers and Internet technologies, enable new ways of learning rather than simply allow students to do what they have done before in a better way. Ghasemi and Hashemi (2011), emphasised that ICT helps students to their learning by improving the communication between them and the instructors. ICT has an impact not only on what students should learn, but it also plays a major role on how the students should learn. Accordingly, that most students were of the opinion that the introduction of ICT in the university impacted positively on their information-seeking behaviour (Table 5.15).

The findings brought to light various software used by students in their search for information. This included word processing application software, power point, e-mail application software and internet application software, spread sheet application software, database management system application software and desktop publishing application software (Table 5.8). De Wit, Heerwegh and Verhoeven (2012), asserted that students cannot survive in the current educational system without a satisfactory level of command of ICT skills. They continued by

saying that this satisfactory level of command of ICT skills is necessary for attaining an acceptable level of educational achievement. This supports findings of other studies (Pedro & Maas, 2005; Carle, Jaffee & Miller, 2009; Vernadakis et al., 2011) which have all indicated the need to have an in-depth knowledge of the use of ICT and Library as a means of seeking for relevant information for educational knowledge.

Further information gathered through the interview sections with librarians and students brought to light other software for the same purpose of processing academic information as search engines like google, e-mails and other media applications such as WhatsApp, twitter and Instagram. The software that students were most familiar with and also utilised most for processing information was the word application software. A further deduction could be the high extent to which assignments and term papers presented in printed formats using the word application software have been made compulsory. This is in concord with a statement from a librarian interviewed as follows: *“Most students normally type and print assignments and term papers in MS-word format”* [Student A].

Comparing students' respondents on how well IT and library staff assist them in accessing the information resources, it could be observed that generally students are not certain of the performance IT laboratory staff but more certain that library staff perform their duties of assisting them (tables 5.2 and 5.3). However, majority of the students indicating that they visit the UCC library on the average of 2 times within the week could mean that they are not motivated by the efficiency of resources available in the library (Figure 5.3). Responses from both parties (students and staff in charge of IT and library facilities) were very contradictory. For instance, a student complaint summarising what other colleagues said is as follows: *“The IT staff aren't so welcoming; I find it difficult to call for their assistance whenever I'm stuck by the computer”* [Student H]. In agreement, responses in Table 5.11 indicated that most of the students were of the opinion that the IT laboratory staff are not sociable or approachable to students. On the other hand, the blame game continues from the librarians as follows: *“some students think they know too much so they do not consult us when they encounter problems whenever they are accessing information resources; they end up either frustrated or causing damage to some electronic equipment in the library”* [Student E]. *“Some students are rude by way of their speech and this sometimes, I believe demotivate some librarians to do their best in extending a helping hand to students during their search for information but having said that, we*

have no choice but to assist anyway, that's our job" [Student I]. "Significant number of students also lack the confidence to ask for assistance; some are extremely shy and so until a librarian observe that such a student need assistance and provide some, the student will continue in confusion and subsequently leave the library disappointed" [Student B].

This challenge is crucial and need to be dealt with in a very strategic way by management of IT and library facilities so as to foster good relationship between their staffs and students who patronise the facilities.

6.4 Strategies for satisfying information needs and seeking behaviour of students: The way forward

Analyses of respondents' views suggest the need for more technical assistance for students from IT officers in charge of IT laboratory could be implemented through the development and training of ICT experts, specifically for instruction design and development, who will work in partnership with IT managers and librarians in Universities, is very much needed. This would further help in ensuring monitoring and maintenance of ICT resources which was the most popular suggestion from the students. In line with literature, one most common problem associated with the effective implementation of ICT has been identified as lack of qualified ICT personnel (Singhavi & Basargekar, 2019).

Further recommendations included the need for continuous provision of training of students on computers and ICT skill acquisition. The analysed data show that most of the respondents strongly agree that there is the need for continuous and periodic training of students on computer/ ICT skills to help solve challenges in the use of ICT resources (Table 5.17). In accordance, almost all the respondents are proficient in various basic computer applications (Table 5.7). This possibly suggests that most students are still ignorant about the helpfulness of progressive applications although they are consistent users of computer with many years of experience. Though responses from librarians interviewed indicate that currently, through user education (orientation, information literacy skills) library management is training students to obtain requisite skills to access and use library resources effectively, the results of this study suggest an evaluation of the training.

In concord, Ramayah, Ignatius and Aafaqi (2005) in their study found out that most higher institution students use the PC for basic tasks only such as using spreadsheets and word processing, and have not moved on to more challenging programmes like graphics, web page design, statistical software, etc. A justification why majority of the respondents endorse the need for continuous and periodic training of students on computer/ ICT skills.

The study results show that ICT has impacted positively on their information-seeking goals. Tien and Fu (2008), in their study concluded that the software knowledge of students was a good positive predictor for achievement. Also, Asqari and Haywood (1997) assessed the attitude of undergraduate students in a university toward computers and found that 86 % agreed that computer skills will be beneficial to them in their future career. Further, a study by Maharana, Biswal and Sahu (2009) involving undergraduate students indicated that nearly 100 percent of respondents agree that education and research will not be effective unless ICT tools and techniques are used in the educational process. Nevertheless, it has also been established that the impact is not always helpful (Basri, Alandejani & Almadani, 2018). Further studies could therefore consider possible negative influence of ICT on information-seeking habits of students.

Relationship between students and IT and library staffs per the results of the study was found to be significant in affecting the patronage of the IT and library facilities by students. For instance, However, majority of the students indicating that they visit the UCC library on the average of 2 times within the week could mean that they are not motivated by the efficiency of resources available in the library (Figure 5.3). The result suggest that symposiums should be organised by library management for students and IT and library staffs to provide the platform that would foster the relationship between these two groups which will further enhance learning and research.

Responses from the librarians interviewed brought to light the fact that the library management has made the effort of providing extended library services after the normal working hours. However, significant numbers of students seem not to be satisfied about this move as they opine that lack of time for searching for information affects their use of IT resources in both UCC library and IT laboratory. Possibly implying that students' concerns was not well inculcated in the revision of the visiting times for these facilities. Adequate funding of ICT projects in UCC

library and IT laboratory was also recommended by respondents. In this regard, government at all levels should prioritise issues of ICT, make available adequate funds specially needed for the training of students in computer education.

Ramchander and Naude (2018) mentioned that problems of quality and inadequate resources are made worse by the ever-increasing student populations confronted by higher education institutions. Deducing from the results of the study, the UCC IT laboratory and library can be considered not large enough to accommodate large numbers of students at a goal (Table 5.18). Though the librarians interviewed opined that the IT laboratory space should be enlarged and supplied with more IT resources, the same respondents acknowledged that some efforts have been made by management to curtail the challenge. These included the provision of an enhanced technological space for postgraduate students with maximum sitting capacity of 250 people. Also inclusive in these efforts was the expansion of these facilities to include knowledge commons for the undergraduate students which will complement the I.T laboratory due to the high demand of the facilities and resources. For instance, a response from interviewed confirming this high demand of the facilities and resources is as follows: *“I think the number of computers and other accessories such as printers, photocopiers and scanners have to be increased to meet the ever-increasing student population as there are times when we have to wait in cues for long periods of time before we could use them”* [Student G].

Still in agreement, Table 5.17 depicts students’ opinion that the IT laboratory lacked the required IT resource(s) computer hardware and software, accessories and so on to enhance their use of IT resources in same. It has been emphasised that apart from the expansion of higher education systems expanded worldwide, the nature of the institution within these systems has also been shifting through a process of differentiation (Smolentseva, Huisman & Froumin, 2018). In Table 5.18, majority of students were of the opinion that unavailability of required informative materials is problematic in their use of the UCC library. Hence, the results obtained also suggested that the level of automation of the institution’s library should be improved to increase the rate of its utilisation. However, responses again show efforts made by the library management through the subscription of over 43 academic databases to support teaching and research activities of the students by which most of the materials can be found electronically. This is further advantaged with the provision of an electronic support unit which receives request from students who are too busy to search for information by assisting them. ICT can be

used to remove communication barriers such as that of space and time (Singhavi & Basargekar, 2019). However, students' response could indicate that the network is not adequate to meet their needs (Figure 5.17).

Another suggested solution had to do with the procurement of generator to supplement electricity supply. Unstable power supply according to the results remain a problem encountered by students in the use of IT resources in the UCC IT laboratory (Table 5.18). The results compare favourably with literature, for example, Lawrence and Tar (2018), notes that the most common problems associated with the effective implementation of ICT is inconsistent electric power supply. However, attempts made by management through the provision of a standby generator as acknowledged by all the librarians interviewed could mean that the problem is still not fully addressed. Therefore, the suggestions of acquiring solar power from most of the librarians interviewed as a reliable source of energy to complement the universities power plant seems to be credible considering Ghana's location in the tropical zone blessed with abundant sunshine. However, the government should do well to address seriously the issues of the erratic electricity power supply.

The rationalisations made thus far are consistent with the literature. According to Baada (2018), when they conducted a study on forty years of ICT of Library Services in Nigeria, certain obstacles were observed: periodic breakdowns, antiquated equipment, a lack of maintenance, a lack of technical support, and a lack of proper training. Furthermore, according to Okogwu and Mole (2019), the non-availability of ICTs in Nigerian university libraries was due to a lack of funds and administrative assistance.

More prominently, the findings with regard to Internet usage provide a big challenge not only to Ghana but to other African universities. For quality in higher education to be accomplished in Africa, a more thorough and optimistic method to the delivery of Internet amenities in our tertiary institutions must be implemented. Monitoring and maintenance of ICT resources by ICT management being the most popular suggestion implies that this is a key problem that UCC management should consider addressing for optimum results, should the commendations be prioritised. It could be a reflection of students preferred format of information being electronic as noted in a previous section of this chapter.

6.5 Compliance of findings to theoretical models employed to guide the study

The findings align well with Broder's Standard Model (2002) of the search process (Figure 3.4), which frames the study. The model begins with the assignment (task) at hand, a phase reflecting the user's awareness of a problem. For instance, this was typified by the views from participants such as, *"Sometimes using the Wi-Fi system becomes very frustrating as it sometimes does not function properly, so I visit the internet café a lot"* [Student F]; *"We often receive a number of complaints from students about the Wi-Fi system not functioning properly and therefore making their search for information frustrating"* [Student E]. *"Current number of computers and other accessories has remained fairly inadequate to meet the needs of students over the years"* [Student I].

This is followed by the recognition of a need for information pertaining the task as well an articulation of the associated information need (verbalised form) prior to an information search. For instance, a participant's view such as *"I sometimes consult librarians on selection of suitable textbooks and other informative materials for my assignments"* [Student D]. In tandem with explanation given by Marchionini (1989) as cited in Walhout, Oomen, Jarodzka and Brand-Gruwel (2017), this is a phase that reflecting the user's awareness of a problem. Reflective of this stage of the search process are other views such as *"Sometimes using the Wi-Fi system becomes very frustrating as it sometimes does not function properly, so I visit the internet café a lot"* [Student F]; *"We often receive a number of complaints from students about the Wi-Fi system not functioning properly and therefore making their search for information frustrating"* [Student E]. *"Current number of computers and other accessories has remained fairly inadequate to meet the needs of students over the years"* [Student I].

The next stage is the retrieval and evaluation system. In this regard, Marchionini argues that the electronic systems significantly aid in this process as they provide a much extensive range of methods to articulate queries. Participants' views gathered showed that the most common search engine they apply on the internet to seek information is the google search engine even though they also used Bing, yahoo and ask.com. For instance, Student F's view read, *"I normally use google to search for information; it is simple to manipulate, and I have observed that it gives vast range of search results"* whereas Student G stated, *"Though I use the search engines, Bing and ask.com occasionally, google remains my favourite"* [Student J]; *"I normally use yahoo and google search engines to search for information"*.

The retrieval stage comparing favourably with Marchionini's extraction phase encompasses the information-seeker applying skills such as scanning, reading, copying, storing and listening to important information. For instance: "*At the library, I normally do scanning and photocopying of documents*" [Student G]; "*I normally join my study group to do group discussions on our WhatsApp platform, where I gain more understanding on lectures notes acquired*" [Student J]; "*I do all my print outs of assignments at the electronic department of the library and hope to do a print out of my final draft of dissertation too at the same place; their services are good and very affordable*" [Student F].

The term/stage, corpus, in Broder's model (as explained chapter three refers documents or a collection of written or spoken material stored on a computer) per the findings of the study is identified as the various information resources participants claim to use. For instance, the findings indicate that UCC undergraduate students were fond of using information (library) resources such as internet, lecture notes and handouts, textbooks, thesis and dissertations and electronic journals. The stage is also in compliance with element in Sutcliffe and Ennis's model namely information collections. However, Marchionini's model, which mainly focuses on the electronic environment refers to this stage as selecting a search system, a stage that is somewhat guided by the information seeker's knowledge of the area. Along the lines of this step, Marchionini asserts that information seekers prefer colleagues' sources to official sources of information. The findings indicate that generally, the students access information from the discussions with their colleagues (Table 5.9). However, Marchionini again noted that in practice, information seekers consult several search systems as they move toward solutions to their problems. The findings further indicate that students explored more of the electronic support systems rather than the tangible manual system of information (Table 5.4).

For instance, this is illustrated by participants' views as follows: "*Students normally access the electronic support unit to photocopy and scan documents most of which are notes of colleagues, lecture notes and other lecture materials*" [Student E]; "*I have observed that most students use the internet to obtain academic and personal information through search engines like google, e-mails and other media applications such as WhatsApp, twitter and Instagram*" [Student B]; "*Most students normally type and print assignments and term papers in MS-word format*" [Student A]; "*I enjoy accessing the electronic data base system of the library for information*" [Student J]; "*I sometimes consult librarians on selection of suitable text books and other*

informative materials for my assignments” [Student D]; “I do all my print outs of assignments at the electronic department of the library and hope to do a print out of my final draft of dissertation too at the same place; their services are good and very affordable” [Student F].

In compliance with Marchionini’s model, the findings align well with one of its stage namely definition and comprehension of the problem. The stage involves information users understanding of the problem is reliant on knowledge of the task area and may also be influenced by the setting. For instance, this is typified by participants’ views such as *“The Wi-Fi system must be made more effective through effective monitoring and maintenance strategies” [Student F]; “I think the number of computers and other accessories such as printers, photocopiers and scanners have to be increased to meet the ever increasing student population as there are times when we have to wait in cues for long periods of time before we could use them” [Student G]; “The ICT and library space especially the ICT have to be enlarged to accommodate more students at a goal” [Student D].* The findings also comply with another element in Sutcliffe and Ennis’s model (1998) namely, the role of the searcher's knowledge. For instance, the findings also indicated that students are not challenging themselves with the use of more complex software like the R software, PLS etc. for quantitative research, but just the basic ones. This is confirmed in: *“An observation, I have made have to do with their IT skills; most often students are seen to be using the word processing, Power Point application and internet application software on the computers whether personal computers or that from electronic support unit” [Student E].*

Broadly speaking, the findings of the study complied with two of the stages of Kuhlthau’s (2004) Information Search Process (ISP) model. These were the affective and physical experiences of the Information Search Process. The affective is linked with the feelings or emotions of the user. For instant, this is evident in the following couple of views, *“A couple of IT staffs have been rude towards me and so it discourages me from visiting the IT laboratory whenever it comes to mind” [Student J]; “The IT staff aren’t so welcoming; I find it difficult to call for their assistance whenever I’m stuck by the computer” [Student H].* Also, there was evidence of students getting frustrated due to failure to get access to information resources. Their frustrations were also shared when providing feedback on the library’s facilities and services. Student K said, *“Some students especially Level 100 and 200 students normally complain about limited availability of library materials such as textbooks”; “We often receive*

a number of complaints from students about the Wi-Fi system not functioning properly and therefore making their search for information frustrating” [Student E]. *“Sometimes using the Wi-Fi system becomes very frustrating as it sometimes does not function properly, so I visit the internet café a lot”* [Student F].

The physical, which deals with actions, was typified by the findings in terms of the visits to the ICT and library, consultation of colleagues and librarians, etc. The following views are reflective of the extent of usage of library and ICT resources: *“One observation I have made about students is that, they tend to visit the library more often when they are in academic levels of 100 and 200 than in 300 and 400”* [Student K]; *“A student once told me that after his first year on campus, he never visited the university library till he was in his final year, all because he preferred using the ICT resources for information than accessing information from books, journals and so on”* [Student K]; *“I use my own Wi-Fi, Printer, Photocopier, Lap top computer and other accessories, so I hardly visit the IT laboratory”* [Student D]. Also, the issue of students consulting their peers and librarians is well typified by the verbatims such as, *“Sometimes I receive useful academic information from colleagues in other universities that complement the information that is lacking on campus through my email and WhatsApp accounts on my cell phone or laptop”* [Student D]. The fact that majority of participants indicated that they normally access information from the “discussion with colleagues” received the highest endorsement (Table 5.3); *“I normally consult librarians with challenges of book referencing, journal etc. at the library”* [Student J]; *“I sometimes consult librarians on selection of suitable textbooks and other informative materials for my assignments”* [Student D].

The findings obtained so far confirm the pronouncements of the models which framed the study as shown above. However, not all the elements of the models were captured by the findings of the study.

6.6 Conclusion

This study has provided some useful insights into the way students seek for information and the impact of ICT and library resources on their information-seeking behaviour. This will aid in finding ways of improving on the services offered to students via these facilities to help in promoting quality in higher education on the continent. Generally, the findings suggested strongly that internet together with electronic format types of information have gained the most

popularity as the major among other sources of academic information in the university. The findings further revealed that the students' preference for using electronic information sources to others stems from the turnaround time in using this source, hence, preference for electronic information to print material.

Based on the findings, it could be assumed that the undergraduate students generally take keen interest in academic work. This was evident in their responses and views on purposes for information they seek being to do assignments, term papers, or prepare for quizzes and examinations. The findings suggest that UCC's undergraduate students engage in collaborative information-seeking by seeking assistance from and working together with peers. However, this drift from access of library and ICT laboratory to more of collegial discussions could be linked to challenges encountered by students when accessing these facilities. Their most accessed source of information, especially for quizzes and examinations was found to be collegial discussions followed closely by information from the internet. The difference in popularity of the two sources was ascribed to the students' strategy of capturing most of the issues covered by their respective lecturers in class as they discuss and compare their notes. However, internet use was found to be preferred to sources of information due to expediency of manipulating it for information and the inevitable use of internet for most activities in our modern times.

Deductions from the findings showed that ICT resources is fairly adequate for meeting the students' information need, though the internet among other sources of academic information was found to be the second most accessed. This challenge is crucial and needs to be dealt with in a very strategic way by management of IT and library facilities so as to foster good relationship between their staffs and students who patronise the facilities. The challenges in the use of ICT, if not properly resolved, can hinder the effective use of ICT and library resources by undergraduates and then subsequently affect learning and research. Meanwhile, the responses and the views obtained from data collection showed that the library which was found to be less accessed than the ICT laboratory was under-stuffed with adequate and current library materials which demotivated students to visit the facility. On the positive side, the views of students suggested that the library staff were very accommodating in helping them search for information whenever they confront them with information need and search challenges. Per the discussion of the findings, it could be suggested that the level of automation of the library should be improved alongside provision of adequate and updated study materials to encourage

students' patronage of the facility. The next chapter covers the conclusions and recommendations based on the finding, as well as suggested areas for further studies.

Chapter Seven

Conclusions, limitations and recommendations

7.1 Introduction

The goal of this chapter is to look into and discuss the findings and conclusions in relation to the research objectives posed in Chapter 1. The first section of this chapter discusses the study's conclusions. The study's limitations are discussed in the second section. Following that, recommendations are provided, contribution to theoretical and practical levels are also given and suggestions for further research is discussed. The chapter ends with a summary and remarks.

7.2 Conclusion to the research objectives

As stated in Chapter 1 that there has been limited research on undergraduate students' information needs and information-seeking behaviour, notably in Ghana. Therefore, understanding university students' information needs in terms of ICT and library resources is very paramount, and a study of it might be very useful to information managers at government universities who spend in literature sources and search tools to help students learn and research better. As a result, these managers must have a thorough understanding of students' information-seeking needs and behaviour in order to develop solid information management strategies that adequately fulfil students' information demands. Regardless of existing research literature, this study is unique in that it focuses on a subset of UCC students, notably Education Faculty students, who occasionally leave campus to participate in external activities such as teaching practice. Consequently, the research problem in this study was to empirically analyse information needs and information-seeking behaviour of the Faculty of Education students at the UCC. The following research objectives was posed to address this issue thus to:

1. Explore the kind of information that are needed by the undergraduate students at the University of Cape Coast.
2. Examine the types of information resources that are utilised by the undergraduate students of the institution under study.
3. Investigate the various strategies do that undergraduate education students employ in seeking information resources in the university.

4. Ascertain the efficiency of the University of Cape Coast ICT resources, including the library, to students with respect to promoting sound learning and research work.
5. Examine whether statistically significant differences exist between groups of undergraduate UCC education students in reference to their background information (gender, age, and academic level) to constructs of usage of ICT resources, computer skills of students, ICT software, information-seeking behaviour, ICT support services, usage of library resources, problems in the usage of ICT resources, problems in the usage of library resources, possible solution in the usage of library and ICT resources.
6. Find the determinants that govern the computer skills of students and their information-seeking behaviour.
7. Identify ways of improving for satisfying information needs and seeking behaviour of the undergraduate students at the University of Cape Coast be improved to promote sound learning and research work.

A theoretical and empirical investigation was undertaken to address these research questions. Various existing research in the literature were analysed theoretically. The literature review provided a wealth of material on information needs and information-seeking behavior. The participants in this study were Education students who were about to complete bachelor's degree and were studying at UCC.

7.2.1 Research Objective 1: To explore the kind of information that are needed by the undergraduate students at the University of Cape Coast

The first objective of the study was to identify the information needs of undergraduate students at UCC. From both quantitative and qualitative findings, it is revealed that academic information is the basic information need of undergraduate students at UCC. Furthermore, it was found that internet sources and electronic media are the main sources of information for students. Based on these findings, it can be concluded that academic and scholarly information is the main information need of undergraduate students. This academic information is meant to help students with individual and group assignments as well as project work for final year undergraduate students. Furthermore, it can be stated that students rely on heavily on internet source. Again, majority of undergraduate students are comfortable with electronic resources such as e-books and softcopy of relevant articles and documents. Gathering from this, it is likely that students are more comfortable this with due to the fact the in recent years the use of

computers software and electronics in the academic environment has become increasingly relevant and easier as compared to previous years.

7.2.2 Objective 2: Research Objective 2: To examine the types of information resources that are utilised by the undergraduate students of the institution under study

The purpose of this objective was to ascertain the types of information resources undergraduate students use. From the results, it is evident that discussions with colleagues, lecturers and teaching assistant are information resources utilised by students. Also, it was clearly shown that information from reference sources, media and journals is part of the information resources undergraduate students rely on. This could mean that students are better informed with academic information through discussions with their colleagues than through accessing library resources. Given these findings, it is prudent to conclude that undergraduate students at UCC are much comfortable with their lecturers, teaching assistants, media, books and journals as information resources. It is possible that students outline their lecturers, TA's, media, books and journals because students find them to be reliable sources for their academic and scholarly information. For university students, access to reliable information is extremely essential and thus, it is important that students obtain the required information from dependable sources. Without appropriate and reliable sources of information for undergraduate students may experience difficulty progressing and succeeding in their academic work.

7.2.3 Research Objective 3: To investigate the various strategies do that undergraduate education students employ in seeking information resources in the university

The third objective of this study was to examine the various strategies undergraduate students at UCC apply in seeking information resources. The findings suggest that most students use ICT resources to search for information. These ICT resources include the use of computers and mobile phone internet service to search for academically relevant. Although the majority affirm their use of ICT based strategies to search for information, quite a number indicated that they never make use of ICT resources in searching information. The same pattern was observed for making use of the library resources in searching information. In light of the findings, it can be concluded that computer-based strategies are the most applied strategies students rely in their search for information. Although most students use ICT strategies, others do not find ICT based information strategies helpful. Similarly, library resources, such as reading and reference materials, are underutilized by students. It is possible that students are comfortable using ICT

strategies to search for information because of the recent influx of technology in the academia, and the fact that ICT information search strategies are much easier as compared to traditional information search strategies. Also, there is the likelihood that students do not use library resources since they do not find them helpful.

7.2.4 Research objective 4: To ascertain the efficiency of the University of Cape Coast ICT resources, including the library, to students with respect to promoting sound learning and research work

This objective was stated with the aim of examining how effective ICT and library resources are in enhancing the learning and research work of undergraduate students at UCC. From the findings, it was evident students access information from UCC ICT resources. From the perspective of students, there the ICT resources available for students are adequate and effective. However, some did not find these ICT resources effective. It could be the fact that those who found the IT resources to be inadequate for effective studies and research are the ones that found IT laboratory staff unhelpful in the use of IT resources. Also, students are certain about the IT laboratory staff performance of their duties of assisting them in their use of IT resources. Students find ICT resources in the UCC library effective and efficient because the resources available are helpful for students to study and conduct research effectively.

7.2.5 Research objective 5: To statistically significant differences exist between groups of undergraduate UCC education students in reference to their background information (gender, age, and academic level)

The research objective was included with the sole purpose of knowing how groups of undergraduate UCC education students in reference to their background information statistically differ with respect to the various construct under study. The results showed that gender was not a determining factor on the constructs usage of ICT resources, computer skills of students, ICT software, ICT support services and possible solution in usage of library and ICT resources. However, there was a mean difference between males and females in the composite variables, information-seeking behaviour, use of library resources, problems in using ICT resources, and problems in using library resources. With regard to challenges in using ICT resources, there was no significant variation in averages between age groups, indicating that age had no bearing on students' opinions. In terms of ICT resource usage, student computer skills, ICT software, information-seeking behavior, ICT support services, library resource

usage, problems in library resource usage, and possible solutions in library and ICT resource usage, there were significant differences in means across age groups. In terms of ICT resource usage, student computer skills, ICT support services, and problems with ICT resource usage, there was no significant difference in means across academic levels, indicating that academic level had no bearing on students' opinions. In terms of ICT software, information-seeking behavior, library resource usage, problems with library resource usage, and viable solutions for library and ICT resource usage, there were substantial differences in means between age groups. The views of students on these subjects vary depending on their academic level.

7.2.6 Research Objective 6: Find the determinants that govern the computer skills of students and their information-seeking behaviour

In finding answers to the objective six, nine hypothesis were developed however, some of these hypotheses were not tested because their inclusion resulted a poor model fit. The hypothesis 1, 5, 7 and 8 were not included in the model since their inclusion would have resulted in a poor fit. With hypothesis 2, Usage of library resources has an influence on computer skills of students. The findings revealed that students' computer skills are significantly negatively influenced by their use of library resources at UCC. As a result, library resources do not appear to be benefiting pupils in increasing their computer abilities. This could be due to the fact that students in the library prefer to use printed copies rather than internet resources. Hypothesis 3 revealed that the use of ICT software at UCC is a strong predictor of students' computer skills. This means that students' use of ICT software at UCC increases their quest to improve their computer skills, and that this contribution is due to scientific relationships among the indicators evaluated in the model, rather than chance. Hypothesis 4: ICT support services has an influence on computer skills of students. There is a positive relationship between ICT support services and computer skills. This means that UCC's ICT support services help students develop their computer skills, and that this contribution is due to the scientific connections among the indicators examined in the model, not by coincidence. Hypothesis 6: There is a relationship between usage of library resources and information-seeking behaviour. The results showed that students' use of library resources at UCC enhances their information-seeking behavior, and that this contribution is the result of scientific interactions among the indicators evaluated in the model, rather than chance. Hypothesis 9: There is a relationship between ICT support services and information-seeking behaviour. Scores for information-seeking behavior rise every one-unit increase in ICT support services at UCC. This means that ICT support services at UCC

help students improve their information-seeking behavior, and that this contribution is due to scientific interactions among the metrics examined in the model, rather than chance.

7.2.7 Research Objective 7: Identify ways of improving for satisfying information needs and seeking behaviour of the undergraduate students at the University of Cape Coast be improved to promote sound learning and research work

The final objective of the study was to examine how to improve strategies satisfying the information needs and information-seeking behaviour of UCC students in order to help the studies and research work of students. From both quantitative and qualitative findings, it can be concluded that effective strategies that are likely to improve students information-seeking behaviour include: continuous and periodic training of students on computer skills, respectable relationship between UCC library staff and students, adequate funding of ICT projects in the UCC library and IT lab, good relationship between UCC IT laboratory staff and students, more technical assistance needed by students from IT officers in charge of IT laboratory and providing the UCC library space should be enlarged as well as automated to enhance information-search methods. Students obviously experience challenges in their search for information for their academic work, and in order to curb these challenges students face, there is the need to implement these strategies in order for student to find it easier searching for academically relevant information. Without the implementation of these strategies, it is possible that students would keep experience several challenges and thus make their academic work more difficult.

7.3 Limitations of the study

There are many different types of information users in the university community. Senior lecturers, lecturers, professors, all kinds of students (undergraduate and postgraduate). Administrative staff are also part of the university community who are known as support staff. Unfortunately, the study was limited to Faculty of Education students because they occasionally leave campus to participate in extracurricular activities such as teaching practice. It can be stated that both the literature review and the empirical investigation had certain limitations.

7.3.1 Limitations in the literature review

Furthermore, the literature review was limited to Faculty of Education students as information users, rather than all academic library users. Other university libraries user groups could have

provided other perspectives. There is a paucity of research on the background of Ghanaian University students, however, studies concerning this particular topic is limited. This led to difficulty in getting literature to review. The researcher had to rely on studies that have been done in other geographical areas.

7.3.2 Limitations in the empirical review

Despite the fact that the study's purpose was to look at the information needs and information-seeking behaviour of Education students, the college at the early stages did not want to give us permission to use the students as respondents for the study. There were also some difficulties in getting research assistance as gatekeepers to provided supporting services. Furthermore, the empirical research did not include how computer skills can mediate the relationship between information needs and information-seeking behaviour.

7.4 Recommendations

The authorities and management of the UCC library should be concerned with the information needs of all students in general. From the findings of the study, students of UCC are concerned with obtaining academically relevant information. Thus, there is the need for the UCC library to be able provide services the suits the need of all students.

The results suggest that students of UCC rely on information resources such as lecturers, teaching assistants, reference resources, media and journals. Thus, it is recommended that lecturers and teaching assistants should be afford students ample time to discuss their issues with them. Furthermore, it is recommended that the UCC library should provide relevant reference resources, media and up-to-date journals to help students in their academic work. Also, these resources should be made readily accessible to students. This would go a long way to make the work of students easier and faster.

The results suggest that UCC students rely on computer-based strategies to in their search for information. For this reason, it is recommended that more computer or electronic based resources should be provided to aid the work of students. The influx of technology in academia has made it imperative for students to gain access to computer and technological resources, hence there is the need for the UCC library to provide these resources and make the reliable and accessible to students.

From the findings of the study, it is evident that some students believed that ICT resources in the UCC library efficient. Due to this it is recommended that the UCC library should ensure that ICT resources in the library work effectively to help students' academic activities such as assignments and research work.

Finally, there is the need from the UCC library to provide continuous and periodic training of students on computer skills, respectable relationship between UCC library staff and students, adequate funding of ICT projects in the UCC library and IT lab, good relationship between the UCC IT laboratory staff and students, and provide more technical assistance for students, this because Students obviously experience challenges in their search for information for their academic work. These strategies would help mitigate some of challenges students experience in search for information for their academic work.

7.5 Suggestion for further studies

Research conducted in information needs and information-seeking behaviour of students should consider other factors such as students experiences, student personality and how they affect information-seeking behaviour of students. Also, further studies should consider examining the role the recent digital environments play in the information needs and information-seeking behaviour of the university students.

Additional studies in information needs and information-seeking behaviour of students should be able to examine these variables using longitudinal approaches to effectively examine the long-term effects and benefits of information-seeking among students.

Again, there is the need to examine the information needs and information-seeking behaviour of graduate students, since this study only examined undergraduate students.

Furthermore, future research should investigate various ways of improving the information-seeking behaviour of students at especially the tertiary levels of education. This is because the information-seeking behaviour among tertiary students seems to be poor.

Finally, studies of this nature should be conducted in other tertiary institutions in Ghana. The study was conducted at UCC and thus findings may not be applicable to all other universities and tertiary institutions in Ghana. This would help to reach a nation-wide generalisation on the nature of information needs and information-seeking behaviour of students.

7.6 Contribution on an empirical level

On a theoretical level, those who read this study will be enlightened and get an understanding of the exploration of students' information demands and information-seeking behaviours at UCC in Ghana. The most significant link revealed was that the internet, along with electronic format forms of information, are by far the most commonly used academic information sources at the University. This was attributed to the ease and speed with which these sources may be used. It was also discovered that educational information was the most sought-after information by pupils. The research shed light on the many notions and theoretical models of information-seeking behaviour on a theoretical level. It also helped pupils have a better grasp of the various methods used by university students on campus. The data also revealed that students participate in joint information-seeking with peers with the goal of capturing the majority of the topics addressed in class by their respective lecturers through conversation and note comparing. The findings revealed that ICT resources are sufficient for addressing students' information needs, however they are more frequently used by students than library resources, which are judged to be under-stocked with suitable and current library items, discouraging students from visiting the facility. The study discovered that the students' information-seeking behaviour was impacted in part by the relationship they had with the ICT lab and library employees.

Concerns about the adequacy and deployment of ICTs in universities, as well as the availability and emergence of the same in academic environments, have gained a lot of traction in recent years, according to the literature (Habib, Jamal, Khalil & Khan, 2021). However, when it comes to the information needs of Education students at most universities, there is a significant knowledge gap. Furthermore, the study's findings will contribute to the body of knowledge about students' needs and information-seeking behaviour, improving overall an individual's knowledge in today's globalised educational environment.

7.7 Contribution on a practical level

The survey discovered that all of the participants were young, with only 4% of them being teenagers. This is significant for the study since today's youngsters may be more enthusiastic about the use of technology, particularly in the area of information gathering.

The data revealed that pupils obtain information via talks with their peers in general. This could indicate that students are properly informed about academic topics through conversations with their peers rather than using library resources. According to the data, interaction with colleagues and the internet are the most important sources of academic information in the institution. The findings suggest that manipulating the internet in their hunt for academic information may be more convenient. Furthermore, most students were more familiar with the internet, word processing software, and how to use it than with other forms of software. Another factor to consider is the large percentage of projects and term papers that are required to be submitted in printed format using word processing software.

Furthermore, the findings reveal that talks with peers are a typical strategy for students to prepare for quizzes and final exams. The fact that lecturers typically create questions to cover what they have taught in class could be one reason for this popular way of making for quizzes and final examinations by students. As a result, depending on the views of colleagues who were available and updating notes if there are any errors in them could be a safe strategy to capture most of the concerns mentioned.

Finally, due to these library and ICT issues, educational institutions should adopt new viewpoints in order to better student information search. The findings of this study should aid future researchers in improving their information literacy and search abilities in Ghanaian higher educational institutions.

7.8 Conclusion

This study aimed to explore student's information needs and information-seeking behaviour. Conclusions above depicts several factors that come to play during information-seeking processes by students These include reason for which the information is sought after; the usefulness of the information; the convenience in handling or manipulating the information received; the efficacy of the information resource facility (i.e. ICT laboratory or library); the

relationship between the students and managers or stewards of these facilities; adequacy of skills required for seeking information and management of information resource facilities. The findings of this study have shown that all these affect students information-seeking behaviour and therefore could be broadly associated with the general patterns of information search by students in universities. It has become inevitable for modern librarians to provide best possible information needs for students without changing and adapting to new demands and technology that provide better resources and services to the students. Hence, the continually increasing popularity of automated libraries in our era. Management of information systems at UCC should therefore think of new techniques which will entice students more to access the ICT and library services in the institution. Thus, the empowerment of the users of these aforementioned facilities is very necessary. Therefore, a continued effort is required by librarians to understand the information users need, in this case students, to meet their expectations and demands.

About the theoretical perspective, the study establishes an empirical based framework that would serve as a blueprint for other researchers who are interested in investigating similar topic but in different geographical context. This case study suggests a strong association between information-seeking behaviour patterns and information needs of students. Future studies could consider statistically investigating the relationship between the independent variables Types of information, Information Sources Used, User Awareness, User Education and dependent variable (Information Needs).

Personal reflection on the study

The whole process of the research was very interesting. Though I spent a great deal of time undertaking this project, I learnt that once I set goals, sticking to perseverance and discipline, I could achieve them. There were countless times when I had to push myself to go the extra mile during the study period. However, I realised that once I enjoyed what I was doing, success was easier at each stage of the research.

The theoretical framework as well as the information gained from the interviewees were very useful in achieving the purpose of the study, which was to inquire into the information-seeking behaviour displayed by the undergraduate students at UCC. These data aided in understanding the research problem and further justified the assumption made in the preliminary stage of the work that the establishment of the ICT laboratory had added much to the study or research needs of the students through its role of supplementing the services provided by the library. The research problem under study encompasses challenges of information users faced in their search for information and lapses in strategies employed by management of information resources that aid information users. In addition, the research problem is a very significant one considering this modern era where information-seeking is not only an essential part of learning process of students but also a common activity in society.

All the literature I consulted on the topic was of unlimited worth and aligned with modern developments on information-seeking behaviour. I systematically read and analysed many relevant literatures and previous research on the topic to gain an understanding of the research phenomenon. Choosing appropriate theories to guide the study was really a tedious process as most of them were closely related. To deal with this challenge, I undertook a thorough analyses of the theories to select those that are best related to the subject matter of the study to enable me to gain a deeper comprehension of different Information-seeking Behaviours of students. I understood the theories even better during interviews with the participants of the study.

The dialog I had with the interviewees gave me very useful information that would have been hard go get from merely examining the various literatures I consulted in that it was taken from direct experience. My awareness of the need for confidentiality increased steadily as I conducted more interviews. Considering at least the participants' views, I understood better that

they were at a level of risk in talking to me. Hence, the need for continuously reassuring them that information they gave me would remain confidential.

Reflecting on my experiences during this study, I realise that these experiences have helped me improve my writing abilities and research skills. I deem it my personal journey into the world of information resources inhabited by information seekers of different information needs. Like any journey, some of the most remarkable experiences come from data collection, data analysis stages and discussion of results. For instance, transcribing all the interviews and the administration of the questionnaires was interesting but very challenging and a daunting task. Transcribing all the interviews was most demanding and time consuming. Then another big challenge was about which data to choose and use, and to arrange in a way that was both appealing to potential readers or assessors of the finalised manuscript of the study.

One of my strengths is that I have no difficulty getting people to talk. Therefore, I did my best to conduct interviews in a very flexible manner to allow the opportunity of tracking areas of inquiry that were significant to the individual. However, there were times when I had to formulate related questions to prevent myself from spending much time on issues that were very irrelevant to the study. Also, since all the interviews had to be transcribed, the challenge was to keep them short without sacrificing relationship building conversation. With this problem in mind, and other related ones, the coordination of interviews became a much more time consuming and challenging task. Along with the conduction of more interviews, I developed my theoretical framework and as well reflected on my observations. This process enhanced my confidence in my interpretation and comprehension of the information-seeking behaviours.

It has been very beneficial working under my supervising Professor in that he has given me the opportunity to develop research and writing skills. Professor MT Gumbo's feedback and guidance during my research was ample to clearly draw my attention to the parts of my research which were passable and those which were not. Hence, I gradually and finally gained an insight of the subject of my thesis with his intellectual capabilities and expertise in the field and the general rigour about scientific research.

Reflecting on the experience of writing this thesis, I realise that it has helped me both as a student and as a young/developing professional. I believe that I now possess better writing

abilities and research skills. Generally, the journey through this study has been both a cherished and pleasurable experience. I am very confident of my preparedness for any future academic and career years.

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Appendices

Appendix 1: Interview transcript from students (I)

Item	Participant: J
1	<p>What kinds of information (library) resources do you mostly seek after from the library?</p> <p><i>“I usually get information from the internet, books and journals”.</i></p> <p><i>“I normally use the information for my assignment, quizzes and exams”.</i></p>
2	<p>What about that of library services? <i>“I normally consult librarians with challenges of book referencing, journal etc. at the library”.</i></p> <p><i>“I also often borrow books, do scanning, photocopying and printing of documents at the library”.</i></p>
3	<p>What strategies do you employ in seeking information resources in the university?</p> <p><i>“I normally join my study group to do group discussions on our WhatsApp platform, where I gain more understanding on lectures notes acquired”.</i></p> <p><i>“Though I use the search engines, Bing and ask.com occasionally, google remains my favourite”.</i></p> <p><i>“We are normally asked by lecturers to present assignments in MS word format”.</i></p>
4	<p>What current challenges do you encounter in your usage of library resources and services?</p> <p><i>“some textbooks are not current though provide useful information and some inadequate per their numbers”.</i></p>
5	<p>What about the efficacy of librarians regarding the assistance the give you in your search for information?</p> <p><i>“A couple of IT staffs have been rude towards me and so it discourages me from visiting the IT laboratory whenever it comes to mind.”</i></p> <p><i>“I am very good at manipulating electronic information resources than the hard prints so don’t really bother to consult any IT staff whenever I encounter software problems”.</i></p>

6	<p>What do you think about the library resources and how do you evaluate its usability?</p> <p><i>“I enjoy accessing the electronic data base system of the library for information.”</i></p>
	<p><i>“I must say, that generally, the library resources such as the electronic database system are satisfactorily accessible”</i></p>
7	<p>What do you think about the library system with respect to searching for resources?</p> <p><i>“The library to some extent has been useful in my search for information”.</i></p>
8	<p>What do you think about the IT services provided by the library system about searching for information?</p> <p><i>“Generally, the UCC IT laboratory is good in terms of its accessibility.”</i></p> <p><i>“Availability of computers and other accessories like photocopier, scanners and so on reduces the burden of processing and transportation of information obtained in the library”.</i></p>
9	<p>What suggestions would you give the management of UCC for improving information resources to satisfy students information needs and seeking behaviour and promoting sound learning and research work of students? <i>“Library and ICT staff should be taken through a training on relationship management, so they learn to relate to students better to promote sound learning”.</i></p> <p><i>“I also think that the ICT resources should be maintained well”.</i></p> <p><i>“The IT laboratory and library space should be expanded and equipped with more resources to help us in information-search process”.</i></p>

Appendix 2: Interview transcript from students (II)

Item	G
1	<p>What kinds of information (library) resources do you mostly seek after from the library?</p> <p><i>“In fact, the internet has been useful; I get information almost all for my assignment from the internet, textbooks and lecture notes”.</i></p>
2	<p>What about that of library services?</p> <p><i>“At the library, I normally do scanning and photocopying of documents”</i></p>
3	<p>What strategies do you employ in seeking information resources in the university?</p> <p><i>“Most lecturers ask that we convert our term papers in MS word format to PDF prior to submission”.</i></p> <p><i>“I normally use yahoo and google search engines to search for information”.</i></p> <p><i>“I normally photocopy of and as well bind past examination and quizzes materials”.</i></p>
4	<p>What current challenges concerning do you encounter in your usage of library resources and services?</p> <p><i>“I think the number of computers and other accessories such as printers, photocopiers and scanners have to be increased to meet the ever-increasing student population”.</i></p>
5	<p>What about the efficacy of librarians regarding the assistance the give you in your search for information?</p> <p><i>“I like the way they heartily assist me in searching for books and other informative materials in the library”.</i></p>

6	<p>What do you think about the library resources and how do you evaluate its usability?</p> <p><i>“The serenity of the library helps me to concentrate during research and studies”.</i></p>
7	<p>What do you think about the library system with respect to searching for resources?</p> <p><i>“I can’t really tell”.</i></p>
8	<p>What do you think about the IT services provided by the library system about searching for information?</p>
	<p><i>“I think the number of computers and other accessories such as printers, photocopiers and scanners have to be increased to meet the ever-increasing student population as there are times when we have to wait in cues for long periods of time before we could use them”.</i></p>
9	<p>What suggestions would you give the management of UCC for improving information resources to satisfy students information needs and seeking behaviour and promoting sound learning and research work of students?</p>

Appendix 3: Interview transcript from students (III)

Item	F
1	<p>What kinds of information (library) resources do you mostly seek after from the library?</p> <p><i>“I get access to theses, journals and other scholarly materials at the library.”</i></p> <p><i>“I do all my print outs of assignments at the electronic department of the library and hope to do a printout of my final draft of dissertation too at the same place; their services are good and very affordable”</i></p>
2	<p>What about that of library services?</p> <p><i>“Their services are somehow okay”.</i></p>
3	<p>What strategies do you employ in seeking information resources in the university?</p> <p><i>“I normally use google to search for information; it is simple to manipulate, and I have observed that it gives vast range of search results”.</i></p> <p><i>“I have benefited so much from academic WhatsApp platforms that I joined a couple of years back on campus; I sometimes receive useful academic information for my assignments through this medium”.</i></p>
4	<p>What current challenges do you encounter in your usage of library resources and services?</p> <p><i>“Sometimes using the Wi-Fi system becomes very frustrating as it sometimes does not function properly, so, I visit the internet café a lot”.</i></p>
5	<p>What about the efficacy of librarians regarding the assistance they give you in your search for information?</p> <p><i>“I am okay with the assistance I receive from them; it gets me motivated to keep visiting the library.”</i></p>

6	<p>What do you think about the library resources and how do you evaluate its usability?</p> <p><i>“Books in the library are fairly adequate for effective studies”.</i></p>
7	<p>What do you think about the library system with respect to searching for resources?</p> <p><i>“The library system is not bad at all but needs regular monitoring and maintenance to enhance information search”.</i></p>
8	<p>What do you think about the IT services provided by the library system about searching for information?</p> <p><i>“The internet connectivity isn’t so stable, and this is a major problem that affects our search for information whiles using IT resources”.</i></p>
9	<p>What suggestions would you give the management of UCC for improving information resources to satisfy students information needs and seeking behaviour and promoting sound learning and research work of students? <i>“The Wi-Fi system must be made more effective through effective monitoring and maintenance strategies”</i></p>

Appendix 4: Interview transcript from students (IV)

Item	D
1	<p>What kinds of information (library) resources do you mostly seek after from the library?</p> <p><i>“Occasionally, I access information from hard print thesis and e-journals for my term papers”.</i></p>
2	<p>What about that of library services?</p> <p><i>“I normally do book binding, printing and photocopying at the library”.</i></p>
3	<p>What strategies do you employ in seeking information resources in the university?</p> <p><i>“Most of our group assignments are presented orally together with application of power point software”.</i></p> <p><i>“Sometimes I receive useful academic information from colleagues in other universities that complement the information that is lacking on campus through my email and WhatsApp accounts on my cell phone or laptop”.</i></p> <p><i>“I normally scan pages of books that are not for borrowing at the electronic section of the library and upload to my cell phone or laptop”.</i></p>
4	<p>What current challenges concerning do you encounter in your usage of library resources and services?</p> <p><i>“Unstable power supply makes the use of electronic resources available at the library very frustrating”.</i></p>
5	<p>What about the efficacy of librarians regarding the assistance the give you in your search for information?</p> <p><i>“I sometimes consult librarians on selection of suitable textbooks and other informative materials for my assignments”</i></p>

6	<p>What do you think about the library resources and how do you evaluate its usability? <i>“Well, somewhat okay”</i></p>
7	<p>What do you think about the library system with respect to searching for resources? <i>“Well, somewhat okay”</i></p>
8	<p>What do you think about the IT services provided by the library system about searching for information?</p> <p><i>“I use my own Wi-Fi, Printer, Photocopier, Lap top computer and other accessories, so I hardly visit the IT laboratory”</i></p>
9	<p>What suggestions would you give the management of UCC for improving information resources to satisfy students information needs and seeking behaviour and promoting sound learning and research work of students?</p> <p><i>“The ICT and library space especially the ICT have to be enlarged to accommodate more students at a goal”.</i></p> <p><i>“Management need to beef up availability of library materials to enhance our studies”.</i></p>

Appendix 5: Interview transcript from students (V)

Item	
1	<p>What kinds of information (library) resources do you mostly seek after from the library?</p> <p><i>“I normally search for information from journals, electronic books and hard print books in the library”.</i></p> <p><i>“In preparing for quizzes and exams I normally search for past examination papers but for assignments and term papers, I usually access the internet”.</i></p>
2	<p>What about that of library services?</p> <p><i>“I do borrow books often from the library”.</i></p>
3	<p>What strategies do you employ in seeking information resources in the university?</p> <p><i>“I often photocopy or scan information in books I access in the library but for those found on the internet, I print out and or sometimes save them on my pen drive”.</i></p>
4	<p>What current challenges do you encounter in your usage of library resources and services?</p> <p><i>“Most of the library books are outdated coupled with unstable internet which is sometimes due to unstable power supply”.</i></p>
5	<p>What about the efficacy of librarians regarding the assistance the give you in your search for information?</p> <p><i>“Some library staffs are not so welcoming and so I find it difficult to approach them for help whenever I need one”.</i></p>

6	<p>What do you think about the library resources and how do you evaluate its usability?</p> <p><i>“Most of the resources at the library are accessible but monitoring and maintenance of these resources should be done properly”.</i></p>
7	<p>What do you think about the library system with respect to searching for resources?</p> <p><i>“The library system is okay but the stewards who are the librarians should do well to assist us in our search for information”.</i></p>
8	<p>What do you think about the IT services provided by the library system about searching for information?</p>
	<p><i>“The IT services is okay, but it is hindered by unstable power supply”.</i></p>
9	<p>What suggestions would you give the management of UCC for improving information resources to satisfy students information needs and seeking behaviour and promoting sound learning and research work of students?</p> <p><i>“The library should put strategies in place to prevent some of our colleagues from hijacking some of the library books in their rooms”.</i></p> <p><i>“I also think that library staffs should be trained well on how they are to assist students in their search for information without intimidating them”.</i></p> <p><i>“Solar energy could be used to solve the erratic power supply problems hindering information search processes on campus”.</i></p>

Appendix 6: Interview transcripts from librarians (I)

Item	B
1	<p>What kinds of information (library) resources are mostly sought after from the library by undergraduate students?</p> <p><i>“The students normally chase after a variety of information”.</i></p> <p><i>“Though students are sometimes seen searching for information for personal and other purpose other than academic, but the latter remains a main type of information they look for almost every day”.</i></p>
2	<p>What about that of library services?</p> <p><i>“The students normally access the library’s electronic data base for books, journals and so on”.</i></p> <p><i>“I normally help students in searching for suggested reference materials for their assignments.”</i></p>
3	<p>What can you say about the strategies the undergraduate students employ in seeking information resources in the university?</p> <p><i>“I have observed that most students use the internet to obtain academic and personal information through search engines like google, e-mails and other media applications such as WhatsApp, twitter and Instagram”.</i></p> <p><i>“I have also observed that senior level students, that is those in their 3rd and 4 years, tend to visit the library more often than their juniors as most of them complain that they find the information from Internet more updated and easier to process than that in the library.”</i></p> <p><i>“As part of their search process, they photocopy and scan the notes of colleagues, lecture materials and so on”</i></p>

4	<p>What are the current challenges concerning the usage of library resources and services by students?</p> <p><i>“Most of the students complain that the information in the library is outdated compared to those available on the internet.”</i></p> <p><i>“Also, other students normally complain about inadequacy of library materials such as textbooks”.</i></p> <p><i>“However, significant number of students also lack the confidence to ask for assistance; some are extremely shy and so until a librarian observe that such a student need assistance and provide some, the student will continue in</i></p>
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	<p><i>confusion and subsequently leave the library disappointed.”</i></p>
5	<p>What about the efficacy of librarians regarding the assistance the give students in their search for information?</p> <p><i>“There have been only a few occasions in a year when I couldn’t meet students need when they consulted me for assistance, aside that I am convinced that most of their needs are met through the library services provided.”</i></p> <p><i>“I am proud to say of a student friend now in level 400 who very often consulted me with software errors often during his early years on campus, but he scarcely does that now as he is able to solve those problems himself”.</i></p>
6	<p>What do you think about the library resources and how do you evaluate its usability?</p> <p><i>“resources in the library okay but as it stands it is gradually failing to meet the growing population of students each year due to damages and losses”.</i></p>

7	<p>What do you think about the library system with respect to searching for resources?</p> <p><i>“I have observed that quite a number of students who visit the library do not use library materials like books but all they do is access information from the internet through their cell phones and lap top computers in addition to ones they access from the library’s electronic data base.”</i></p> <p><i>“It’s very obvious that students are more attracted to the electronic forms of information in the library than the tangible ones like hard print books, journals and so on and so increasing the level of automation should be beefed up a little more”</i></p>
8	<p>What do you think about the IT services provided by the library system about searching for information?</p> <p><i>“I can say that on the whole it is good with regards to its accessibility”.</i></p> <p><i>“However, currently number of computers and other accessories isn’t enough to meet the needs of students’ with regards to their information needs.”</i></p> <p><i>“The “too knowing attitudes” of some students prevent them from consult us with problems they encounter whenever they are accessing information resources. Consequently, they become disappointed in the end as they either end up frustrated or cause damage to some electronic equipment in the library...”</i></p>
9	<p>What strategies are in place for satisfying information needs and seeking behaviour of the students to promote sound studies?</p>
	<p><i>“The library management has extended library services after the normal working hours. This has even been made lengthier, with extension from night-time to dawn during examination periods.</i></p> <p><i>“A standby generator has been set up to control the issue of unstable power supply which negatively affects the use of the UCC library.”</i></p>

10	<p>What suggestions would you give for improving these strategies for satisfying information needs and seeking behaviour and promoting sound learning and research work of students?</p> <p><i>“Solar power would do better as a reliable source of energy to complement the universities power plant which is sometimes malfunctioning or overstretched in its utilisation”.</i></p> <p><i>“students are being train to have requisite skills to access and use library resources effectively through user education (orientation, information literacy skills) from the library management.”</i></p> <p><i>“The library should be supplied with more current library materials to promote high accessibility of same”.</i></p> <p><i>“There is the need for measures to be put in place to curtail the issue unstable electricity power in the country to promote the use of ICT in the institution”.</i></p>
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Appendix 7: Interview transcripts from librarians (II)

Item No.	E
1	<p>What kinds of information (library) resources are mostly sought after from the library by undergraduate students?</p> <p><i>“I see most of the students searching for information for their assignments, term papers and project works.”</i></p> <p><i>“So, most of the information they seek daily is for academic purposes”</i></p>
2	<p>What about that of library services?</p> <p><i>“Some students especially Level 100 and 200 students normally complain about limited availability of library materials such as textbooks”.</i></p> <p><i>“Library services over the years have been fairly good but improving at a very slow pace, in that every working day, I come across a reasonable number of students who are frustrated in their search for information from the library”</i></p>
3	<p>What can you say about the strategies the undergraduate students employ in seeking information resources in the university?</p> <p><i>“Students normally access the electronic support unit to photocopy and scan documents most of which are notes of colleagues, lecture notes and other lecture materials”.</i></p> <p><i>“An observation, I have made have to do with their IT skills; most often students are seen to be using the word processing, Power Point application and internet application software on the computers whether personal computers or that from electronic support unit.”</i></p> <p><i>“The students are fond of using media applications such as search engines like google, e-mails WhatsApp, twitter and Instagram to search for information”.</i></p>

	<p><i>“Mostly the students print out information in MS-word format especially for assignments and term papers”.</i></p>
4	<p>What are the current challenges concerning the usage of library resources and services by students?</p> <p><i>“I have realised that the students tend to visit the library more often when they are in their 1st and 2nd years than in 3rd and 4th”. So, it is not surprising that most of the complains about limited availability of library materials such</i></p>
	<p><i>as textbooks mostly come from the Level 100 and 200 students”.</i></p> <p><i>“My interaction with some final year students, revealed that they find the information from Internet more updated and easier to process than that in the library.”</i></p>

5	<p>What about the efficacy of librarians regarding the assistance the give students in their search for information?</p> <p><i>“some students think they know too much so they do not consult us when they encounter problems whenever they are accessing information resources; they end up either frustrated or causing damage to some electronic equipment in the library...”</i>.</p> <p><i>“... The impoliteness of some students by manner of their speech sometimes, discourage some of us to do our best in assisting students during their such for information.</i></p> <p><i>“I have realised that some students, lack confidence to approach me for assistance; I don’t know whether it is due to shyness or ego and therefore leave the library disappointed.”</i></p>
6	<p>What do you think about the library resources and how do you evaluate its usability?</p> <p><i>“Yearly, I come across significant numbers of students who are one way or the other frustrated by the time they are done with their mission at the library and about to leave”</i></p>
7	<p>What do you think about the library system with respect to searching for resources?</p> <p><i>“I have realised that some limited library books are borrowed over and over again by the same students”</i>.</p> <p><i>“However, my personal investigations points to the fact that some students fail to return books they borrow from the library because those books aren’t enough in the system and therefore decide to hijack these books under the selfish motive of possessing for a lengthier time”</i>.</p>

	<p><i>“Though the library has served students for some time now, its system needs to be improved. For instance, even with my assistance on several occasions students are unsuccessful in their search certain academic books”.</i></p> <p><i>“All in all, I believe this problem could be ascribed to lack of adequate re</i></p>
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	<p><i>stocking of library materials as significant numbers of the library books are outdated and partly damaged, making them unattractive”.</i></p>
8	<p>What do you think about the IT services provided by the library system about searching for information?</p> <p><i>“Students are not affected by closure times of IT laboratory due to Wi-Fi connection as they can comfortably access the internet on the personal computers and phones within their comfort zones within UCC’s Wi-Fi zones”.</i></p> <p><i>“Now, thanks to IT, students are able to carry loads of information with ease which could have been tedious to carry in hard prints.”</i></p> <p><i>“Also, through media applications such as WhatsApp and so on communication between lecturers and students on academic issues have been enhanced”.</i></p>

9	<p>What strategies are in place for satisfying information needs and seeking behaviour of the students to promote sound studies?</p> <p><i>“An enhanced technological space with maximum sitting capacity of 250 people has been provided by the library management to enhance post graduate studies.”</i></p> <p><i>“Management has subscribed for over 43 academic databases to support teaching and research activities of the students by which most of the materials can be found electronically.”</i></p> <p><i>“there is the electronic support unit which receives requests from students who are too busy to search for information by assisting them.”</i></p> <p><i>“The library management has extended library services from 9:00am – 4:30pm, then from 4:30pm to 10:00pm and from 10:00pm to 5:00am in the morning during examination periods”.</i></p> <p><i>“A standby generator has been procured and installed to check the power outage which negatively affects the use of UCC library.”</i></p> <p><i>“students are being train to have requisite skills to access and use library resources effectively through user education (orientation, information literacy skills) from the library management.”</i></p>
10	<p>What suggestions would you give for improving these strategies for satisfying information needs and seeking behaviour and promoting sound learning and</p>

research work of students?

“Solar power would do better as a reliable source of energy to complement the universities power plant which is sometimes malfunctioning or overstretched in its utilisation”.

“It is high time the government take seriously the issues of the erratic electricity power supply and its negative effects on the use of ICT in the institutions”.

“Management of UCC IT laboratory should implement sustainable strategies that would help curb the problems of unstable power supply such as solar power utilisation to complement electrical energy from power plant and hydro powered plant source”

Appendix 8: Questionnaire for students

The purpose of this study is to collect information on information needs and seeking behaviour of University Students. You would be contributing towards an effective study if you answer the following questions as frankly as you can. Your responses are confidential. I will be happy if you could answer the questionnaire without discussing it with your colleague. Your view(s) is/are most essential.

Thank you!

Instructions

For questions 1 and 2 kindly tick (√) the appropriate responses to each item. For questions 3 to 34, kindly tick (√) below, the appropriate responses that best reflect the extent to which you agree or disagree with following statements. Key: SA – Strongly Agree A– Agree U– Undecided or neutral D – Disagree SD – Strongly Disagree

Background Information of Respondent					
Level: 100 [] 200 [] 300 [] 400 []					
Gender a. Male [] b. Female []					
Research Question 1: What kind of information is needed by the undergraduate students at UCC?					
Research Question 2: What types of information resources are utilised by the undergraduate students of UCC?					
3. I normally access information from:	SA	A	U	D	SD
a. conference proceedings					
b. internet (online databases, email, etc.)					
c. reference sources					
d. journals					

e. discussion with lecturers and teaching assistants					
f. discussion with librarians					
g. discussion with colleagues					
h. media (newspapers, magazines, TV, radio, etc.)					
4. The prominent type of information I search for about my course of study is:					
a. information for personal development.					

b. academic information.					
c. employment information.					
5. The major sources of academic information in the university are:					
a. lecture notes and handouts					
b. internet					
c. discussion with lecturers/Teaching Assistants					
d. discussion with colleagues					
e. consulting and photocopying colleagues' notes					
f. textbooks					
g. thesis/Dissertations					
h. newspapers					
i. CD-ROMs database					

j. print Journals					
k. electronic Journals					
Research Question 3: What strategies do the undergraduate education students employ in seeking information resources in the university?					
6. I normally search for information by:	SA	A	U	D	SD
a. saving the Internet					
reading (books, conferences proceedings, journals, newspapers, magazines, etc)					
c. general awareness					
d. journals					
e. discussions					
f. research work					
watching and/or listening to TV or radio programmes					
I normally make use of ICT resources for searching information:					
a. once a day					
b. 2 times a day					
c. 3 times a day					
d. 4 or more times day					

e. Never					
I normally make use of library resources for searching information:					
a. once a day					
b. 2 times a day					
c. 3 times a day					
d. 4 or more times day					
e. Never					
9. I possess:					
a. much knowledge in the use of ICT resources					
b. enough knowledge in the use of ICT resources					
c. little knowledge in the use of ICT resources					
d. no knowledge in the use of ICT resources					
10. I normally					
a. use computers in my search for information					
b. browse the internet in my search for information					
c. access my e-mail in my search for information					
d. use networking in my search for information					
e. use CD-ROM					
f. use telephones in my search for information					

g. photocopiers in my search for information					
h. scanners in my search for information					
i. printers					
j. listen to the radio in my search for information					
k. watch television in my search for information					
How well do you agree or disagree with the following statements pertaining your computer skills?					
a. I am very good at typing					
b. I can browse very well					

normally use all the keys on the computer keyboard					
I can perform functions such as using the start button to launch programme					
e. I am able to close a window from taskbar					
f. I am able to minimize a window from a task bar					
g. I am able to restore a window from a task bar					
am able to name work on hard drive before saving.					
i. I am able to save work on hard drive					
j. I am able to save work in appropriate named file					

l. I am able to print using the print button on the software tool bar					
l. I can use the mouse to select icons					
m. I am able to use the mouse to open windows					
n. I can single click a mouse button					
o. I can double click a mouse button					
p. I can save work from computer to pen drive					
q. I can save work from pen drive to computer					
How well do you agree or disagree with the following statements pertaining your usage of the application software indicated below?	SA	A	U	D	SD
a. word processing					
b. spread sheet					
c. data base management system					
d. desktop publishing					
e. presentation software, e.g. Power Point					
f. e-mail					
g. internet					
h. other (please specify)					
13. I obtain information for my assignment from:					
a. lecture notes					

b. library materials					
c. the internet					
d. others (please specify)					
I normally prepare for quizzes and end of semester examinations by:					
a. studying lecture notes					
studying information on subject from library materials					
c. studying information on subject from the internet					
d. discussion with colleagues					
Research Question 4: How efficient are UCC's ICT resources, including the library, to students with respect to promoting sound learning and research work?					
I normally access ICT resources at UCC IT laboratory:					
The ICT materials or resources (i.e. computers, application software's etc.) are enough for effective studies or research					
Availability of internet resources in the UCC IT laboratory is:					
a. Poor					
b. fair					
c. good					
d. very good					

e. excellent					
18. I visit UCC ICT laboratory:					
a. once per week					
b. 2 times per week					
c. 3 times per week					
d. 4 times or more per week					
e. not at all					
19. I normally access the ICT resources:					

a. 1 hour in a day					
b. 2 hours in a day					
c. 3 hours in a day					
d. 4 hours or more in a day					
e. Not at all					
20. The IT laboratory staff usually assist me to:					
a. resolving software errors					
b. rectifying hardware problems					
c. in printing of documents					
d. scanning					
e. downloading information					

f. photocopying					
g. searching for information on the internet					
21. The present status of UCC IT laboratory services is:					
a. Poor					
b. good but needs improvement					
c. good					
d. very good					
e. excellent					
22. Information in the UCC IT laboratory is:					
a. highly accessible					
b. accessible					
c. slightly accessible					
d. inaccessible					
e. highly inaccessible					
I normally access study materials (i.e., textbooks, journals and other documents) for information in the UCC library					
The study materials in the UCC library are enough for effective studies or research					
The general level of availability of ICT resources in the UCC IT laboratory is:					

a. poor					
b. fair					
c. good					
d. very good					
e. excellent					
26. I visit UCC library:					
a. once within the week					
b. 2 times within the week					
c. 3 times within the week					
d. 4 times within the week					
e. not at all					
27. I normally access books in the UCC library:					
a. 1 hour in a day					
b. 2 hours in a day					
c. 3 hours in a day					
d. 4 hours and more in a day					
e. not at all					
28. The IT laboratory staff usually assist me:					
a. in the usage of manual catalogues					
b. in locating textbooks and other documents					

c. searching for bibliographies					
d. in the use of reference books					

e. in accessing the UCC database					
f. in searching for information in newspapers					
29. The present status of the UCC library services is:					
a. Poor					
b. good but needs improvement					
c. good					
d. very good					
e. excellent					
30. In general, the UCC library services is:					
a. highly accessible					
b. accessible					
c. slightly accessible					
d. inaccessible					
e. highly inaccessible					
The introduction of ICT in the university impacted positively on my search for information					

How well do you agree with the following statements as problems encountered by students in the use of IT resources in the UCC IT laboratory?	SA	A	U	D	SD
a. Inadequacy of support network					
Lack of required IT resource(s) (computer hardware and software, accessories, etc)					
c. Lack of time for searching for information					
d. Unstable power supply					
e. Lack of training/help in using IT resources					
f. the UCC IT laboratory staff are not friendly					
g. the UCC IT laboratory is not spacious enough					
33. How well do you agree with the following					

statements about problems encountered by students in the use of the UCC library?					
a. Required informative materials are not available					
b. Lack of time for searching for information					
Current library services are not adequate for enhancing sound learning					
d. Unstable power supply					
e. Lack of training/ help in using library resources					
f. Librarians are not friendly					

g. Library is not spacious enough to enhance learning					
Research Question 5: In what ways can the strategies for satisfying information needs and seeking behaviour of the undergraduate students at UCC be improved to promote sound learning and research work?					
How well do you agree with the following statements pertaining possible solutions to the problems faced by students with the use of the UCC library and ICT resources?	SA	A	U	D	SD
Continuous and periodic training of students on computer/ICT skills					
b. Procurement of generator to supplement electricity supply					
Monitoring and maintenance of ICT resources by ICT management					
Adequate funding of ICT projects in the UCC library and IT lab					
More technical assistance needed by students from IT officers in charge of IT laboratory					
The UCC library space should be enlarged as well as automated to enhance information-					
search methods					
The IT laboratory space should be enlarged and supplied with more IT resources to promote high accessibility of IT resources					

Good relationship between the UCC IT laboratory staff and education students					
Good relationship between the UCC library staff and education students					

Appendix 9: Interview guide for librarians

1. What kinds of information (library) resources are mostly sought after from the library by undergraduate students?
2. What about that of library services?
3. What can you say about the strategies the undergraduate students employ in seeking information resources in the university?
4. What are the current challenges concerning the usage of library resources and services by students?
5. What about the efficacy of librarians regarding the assistance they give students in their search for information?
6. What do you think about the library resources and how do you evaluate its usability?
7. What do you think about the library system with respect to searching for resources?
8. What do you think about the IT services provided by the library system about searching for information?
9. What strategies are in place for satisfying information needs and seeking behaviour of the students to promote sound studies?
10. What suggestions would you give for improving these strategies for satisfying information needs and seeking behaviour and promoting sound learning and research work of students?

Appendix 10: Interview guide for students

1. What kinds of information (library) resources do you mostly seek after from the library?
2. What about that of library services?
3. What strategies do you employ in seeking information resources in the university?
4. What current challenges concerning do you encounter in your usage of library resources and services?
5. What about the efficacy of librarians regarding the assistance they give you in your search for information?
6. What do you think about the library resources and how do you evaluate its usability?
7. What do you think about the library system with respect to searching for resources?
8. What do you think about the IT services provided by the library system about searching for information?
9. What suggestions would you give the management of UCC for improving information resources to satisfy students information needs and seeking behaviour and promoting sound learning and research work of students?

Appendix 11: Ethical clearance certificate



UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2019/09/11

Ref: **2019/09/11/57650993/30/MC**

Dear Mr Agyapong

Name: Mr EM Agyapong

Student No.: 57650993

Decision: Ethics Approval from
2019/09/11 to 2024/09/11

Researcher(s): Name: Mr EM Agyapong
E-mail address: emmapong256@yahoo.com
Telephone: +233 50 540 1587

Supervisor(s): Name: Prof MT Gumbo
E-mail address: gumbomt@unisa.ac.za
Telephone: +27 12 429 3339

Title of research:

Information Needs and Seeking Behaviour: The Case of University Students

Qualification: PhD in Information Studies

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2019/09/11 to 2024/09/11.

*The **low risk** application was reviewed by the Ethics Review Committee on 2019/09/11 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.



Open Rubric

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2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
7. No field work activities may continue after the expiry date **2024/09/11**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

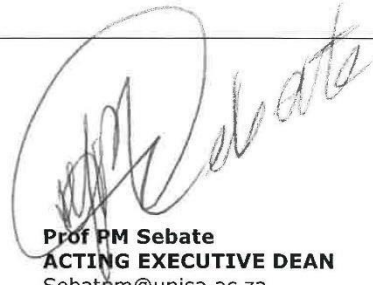
Note:

The reference number **2019/09/11/57650993/30/MC** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Kind regards,



Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
motlhat@unisa.ac.za



Prof PM Sebate
ACTING EXECUTIVE DEAN
Sebatpm@unisa.ac.za

Approved - decision template – updated 16 Feb 2017

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Appendix 12: Letter requesting permission to conduct research

Information Needs and Seeking Behaviour: A Case of University Students

Sam Jonah Library
University of Cape Coast

10th July, 2019

The Faculty Officer
College of Education Studies
University of Cape Coast

Dear Sir/Madam,

I, Emmanuel Manu Agyapong, am doing research under supervision of Mishack T Gumbo, a (lecturer/senior lecturer/professor) in the Department of Information technology (Department of Information Technology) towards a PhD degree at the University of South Africa. We are inviting you to participate in a study “Information Needs and Seeking Behaviour: A Case of University Students”.

The aim of the study is to explore the information-seeking needs and behaviour of UCC education students with respect to their utilisation of ICT laboratory and library facilities to find strategies for improving these services to promote effective learning and research. Your college has been selected because it falls well within the context of this study as it exemplifies an environment of different information-seeking behaviour among user groups. Which somewhat necessitates the need for the management of ICT facilities and academic libraries to understand the information needs of users, in this case students, in order to address those needs. Inevitably for tertiary students, in this contemporary era, information-seeking has become part and parcel of the learning process with its possible associated problems such as difficulty in locating and using information considered useful.

The study would entail seven chapters. The first chapter presents the introduction and background to the study. The rationale for the study, overview of scholarly literature review on

the problem and statement of the problem is provided in this section. In addition, it would introduce the aim and objectives of the study, followed by the significance of the study and a brief overview of the research methodology. Chapter 2 would discuss a literature review on the concept of information, information-seeking and information-seeking-behaviour. It would discuss the role of the ICT in information dissemination and ways of improving information-seeking strategies. A brief background on ICTs in education in Ghana is would also be provided. Previous studies on the information-seeking and needs of students and similar concepts are also discussed. Chapter 3 would motivate and discuss the theoretical framework which served as lens for the study. Both the weaknesses and strengths of the theoretical framework would be acknowledged, and a stance taken about its choice as well as an illustration given as to how it applied in this study. Chapter 4 would entertain an in-depth discussion on the research methodology. The philosophical perspective(s) in which the study is situated would be discussed at length. The chapter would also provide justification for the methods of data collection employed for each research area. In chapter 5 the quantitative results of the study would be presented. Chapter 6 would present the qualitative results of the study and triangulates the quantitative results with them. Finally, chapter 7 concludes the study and provides the reflections which bring the results of all analyses performed into perspective. Limitations and directions for future research are would also be presented in this chapter.

The benefits of this study are firstly its potential provision of useful information that can serve as a basis for comprehensive information on ICT application in the university. In addition, the results of the study will aid establish the existing gaps in the adoption of ICT in the information management operations of universities in complementing the academic library services. This has the potential to lead to the design of appropriate information systems and formulation and implementation services that can aid in making students' search for information less stressful. Therefore, the results of this study can serve as a blueprint for librarians and information managers at UCC to plan the right course of action for the effective use of ICT in furthering education through policy.

Potential risks are not envisaged. There will be no reimbursement or any incentives for participation in the research.

Feedback procedure will entail making the thesis available in a library as well as request made to the researcher for the results.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'Emmanuel Agyapong', with a stylized flourish at the end.

Emmanuel Manu Agyapong PhD Candidate (UNISA)

Appendix 13: Permission granted by UCC

**UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION
OFFICE OF THE DEAN**

Telephone: 0507352668/0554412828
Telex: 2552, UCC, GH
Telegrams & Cables: University, Cape Coast
Email: fste@ucc.edu.gh
Website: www.ucc.edu.gh



University Post Office
Cape Coast, Ghana

Date: 19th July, 2019

Our Ref: FSTE/S.7/V.1/68

Your Ref:

To whom it may Concern
Students (FSTE)
UCC

PERMISSION TO USE EDUCATION STUDENTS AS RESEARCH PARTICIPANTS

The bearer of this letter is Mr. Emmanuel Manu Agyapong. He is a PhD candidate at the University South Africa (UNISA).

Kindly assist him with information he may need to carry out his academic work.

Thank you.

Yours faithfully,

Mrs. Mary Owusu Obimpeh, PhD
FACULTY OFFICER

**FACULTY OFFICER
FACULTY OF SCIENCE &
TECHNOLOGY EDUCATION
COLLEGE OF EDUCATION STUDIES
UNIVERSITY OF CAPE COAST**

Appendix 14: Consent letter for participants

12th June, 2019

Title: Information Needs and Seeking Behaviour: A Case of University Students

Dear Prospective Participant

My name is Emmanuel Manu Agyapong and I am doing research under the supervision of Prof. Mishack T Gumbo, a senior lecturer/professor in the Department of Information Technology towards a PhD at the University of South Africa. We are inviting you to participate in a study entitled “Information Needs and Seeking Behaviour: A Case of University Students”.

This study is expected to collect important information that could serve as a basis for comprehensive information on ICT application in the university. In addition, the results of the study would aid establish the existing gaps in the adoption of ICT in the information management operations of universities in complementing the academic library services. This has the potential to lead to the design of appropriate information systems and formulation and implementation services that can aid in making students’ search for information less stressful. Therefore, the results of this study can also serve as a blueprint for librarians and information managers at UCC to plan the right course of action for the effective use of ICT in furthering education through policy.

You are invited because information to be obtained from you is deemed useful to serving as a basis for comprehensive information on ICT application in the university.

I officially obtained your contact details from the office of the provost of your college. In all, about 10 participants representing the colleges would be interviewed, 5 librarians and 5 students.

What is the nature of my participation in this study?

You are expected to provide your candid opinions on questions pertaining students’ information need and seeking behavior in your institution. The study involves semi-structured interviews.

The instrument is made up of open-ended nature of the questions such “What suggestions would you give for improving strategies for satisfying information needs and seeking behaviour and promoting sound learning and research work of students?”, “What do you think about the library system with respect to searching for resources?” and “What can you say about the strategies you employ in seeking information resources in the university?” etc. The interview process is expected to take an average time of 30 minutes for all the interviews.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

What are the potential benefits of taking part in this study?

The benefits of this study include the provision of useful information that can serve as a basis for comprehensive information on ICT application in the university. In addition, the results of the study will aid establish the existing gaps in the adoption of ICT in the information management operations of universities in complementing the academic library services. This has the potential to lead to the design of appropriate information systems and formulation and implementation services that can aid in making students’ search for information less stressful. Therefore, the results of this study can serve as a blueprint for librarians and information managers at UCC to plan the right course of action for the effective use of ICT in furthering education through policy. Potential risks are not envisaged.

Will the information that I convey to the researcher and my identity be kept confidential?

You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this. Your answers will be given a code number, or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review

Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

Your anonymous data may be used for other purposes, such as a research report, journal articles and/or conference proceedings. Individual participants will not be identifiable in reports of the study that may be when submitted for publication.

How will the researcher(s) protect the security of data?

Hard copies of your answers will be stored by the researcher for a period of five years in a locked filing cabinet at the researcher's office in Cape Coast, Ghana for future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Hard copies will be shredded and/or electronic copies will be permanently deleted from the hard drive of the computer using a relevant software programme.

Has the study received ethics approval?

This study has received written approval from the Research Ethics Review Committee of UNISA. A copy of the approval letter can be obtained from the researcher if you so wish.

How will I be informed of the findings/results of the research?

If you would like to be informed of the final research findings, please contact Emmanuel Manu Agyapong on (+233) 277-775-354 / (+233)-505-401-587 or email: emmapong256@yahoo.com/ emmapong256@gmail.com. The findings are accessible for 5 years.

Should you require any further information or want to contact the researcher about any aspect of this study, please contact (+233) 277-775-354/ (+233)-505-401-587 or email: emmapong256@yahoo.com/emmapong256@gmail.com

Should you have concerns about the way in which the research has been conducted, you may contact Prof. Mishack T Gumbo (0124293339, Gumbomt@unisa.ac.za).

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.



Emmanuel Manu Agyapong

Please sign below if you are willing to have this interview. Your participation is voluntary.

The following signature signifies that I, _____

(print your name) have read, or been informed of, the information about this study titled

“Information Needs and Seeking Behaviour: A Case of University Students” to be undertaken

by Emmanuel Manu Agyapong (57650993).

Appendix 15: Covering letter for student questionnaire

Information on information needs and seeking behaviour of university students

Dear respondent,

This questionnaire forms part of my doctoral research entitled: Information Needs and Seeking Behaviour: A Case of University Students for the degree PhD at the University of South Africa. You have been selected by a purposive sampling strategy from the population of undergraduate regular education students of UCC for the 2017/2018 academic year.

Hence, I invite you to take part in this survey.

The aim of this study is to investigate the information-seeking needs and behaviour of UCC education students with respect to their utilisation of ICT laboratory and library facilities to find strategies for improving these services to promote effective learning and research. The findings of the study may benefit librarians and information managers at UCC as it may serve as a blueprint for them to plan the right course of action for the effective use of ICT in furthering education through policy.

You are kindly requested to complete this survey questionnaire, comprising four sections as honestly and frankly as possible and according to your personal views and experience. No foreseeable risks are associated with the completion of the questionnaire which is for research purposes only. The questionnaire will take approximately 20 minutes to complete.

You are not required to indicate your name or organisation and your anonymity will be ensured; however, indication of your age, gender, occupation position etcetera will contribute to a more comprehensive analysis. All information obtained from this questionnaire will be used for research purposes only and will remain confidential. Your participation in this survey is voluntary and you have the right to omit any question if so desired, or to withdraw from answering this survey without penalty at any stage. After the completion of the study, an electronic summary of the findings of the research will be made available to you on request.

Permission to undertake this survey has been granted by the Ethics Committee of the College of Education, UNISA. If you have any research-related enquiries, they can be addressed directly

to me or my supervisor. My contact details are: (+233)-277-775-354/ (+233)-505401-587 e-mail: emmapong256@yahoo.com/ emmapong256@gmail.com and my supervisor can be reached at 0124293339. Department of Information Technology, College of Education, UNISA, e-mail: Gumbomt@unisa.ac.za.

By completing the questionnaire, you imply that you have agreed to participate in this research. Please note that the completed questionnaires will be collected on day of administration of same.

Appendix 16: Proof of language editing

UNIVERSITY OF CAPE COAST
COLLEGE OF HUMANITIES AND LEGAL STUDIES
FACULTY OF ARTS
DEPARTMENT OF COMMUNICATION STUDIES

Tel: 03321-30944
Email: des@ucc.edu.gh
Our Ref:
Your Ref:



University Post Office
Cape Coast, GHANA

21st March 2022

Certificate of Proofreading

This is to certify that the doctoral thesis "Information Needs and Seeking Behaviour: A Case of University Students" by Emmanuel Manu Agyapong has been thoroughly proofread and edited for clarity in spelling, punctuation, vocabulary, and grammar. It is our hope the necessary corrections and suggestions will be effected in consultations with the candidate's supervisors.

Wincharles Coker, PhD

A handwritten signature in black ink, appearing to read "Wincharles Coker".

Lecturer & Coordinator

Writing Unit

Department of Communication Studies

College of Humanities and Legal Studies

University of Cape Coast, Ghana

Email: wecoker@ucc.edu.gh