

CONCEPTIONAL FRAMEWORK FOR IMPLEMENTING AND ASSESSING AN INTRODUCTORY MODULE IN INFORMATION COMMUNICATION TECHNOLOGIES AT HEIS

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ABSTRACT

It is imperative that every student be empowered with Information and Communication Technology skills early in their academic careers. This is expected to help students achieve higher grades in their academic endeavours and prepare them for their future careers. Global trends have shown that information communication technologies appropriation in HE is critical in developing the 21st-century knowledge worker. This paper highlights motives for implementing an introductory module in ICT in HE. The paper further investigates implementation challenges, as well as measures to address these challenges. An interpretative philosophy using a case study research design is adopted for the study. In-depth interviews were conducted with 10 lecturers who teach the module. These had been purposefully selected using a criterion of at least 2 years of experience teaching the university course. The importance of the module was articulated with major impediments in its implementation being highlighted. Data collected were transcribed, coded, and then analysed using thematic analysis. Results from the empirical study revealed eight key determinants for successfully implementing an introductory module in ICT. These were the availability of the physical infrastructure, availability of the technical infrastructure, availability of technical resources, aligning module content to subject area, implementing manageable classes, continuously updating module content to keep up-to-date with technological changes, fostering a positive attitude toward the module among students, and continuously training students and lecturers ICT skills through short courses and workshops. These key factors were used to conceptualise the study.

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INTRODUCTION

Information Communication Technologies (ICTs) have become a cornerstone to any society's well-being and development. Many sectors in society have to some extent, harness ICTs in their day-to-day activities to smoothen their operations (Roztock, Soja, & Weistroffer, 2019). The education discipline has been encouraged to use ICTs for teaching and learning purposes and implant such skills on 21st-century students, especially in the early days of their academic careers (Charalambidis, 2014; Rana, Greenwood, &

Fox-Turnbull, 2020; Sharma, 2020). Many Higher Education Institutions (HEIs) have put a mandatory introductory course in Information Communication Technologies in their curricula to augment calls for IT diffusion in society (Mabunda, 2010). In many cases, the module is compulsory (requiring everyone to pass the course to graduate), and it is offered university-wide (requiring every student enrolled in any of the programs at the institution to undertake it) (Al-Ahmad, 2010). The module is usually recommended in the first academic year to implant a culture of IT dependency within the student population at an early stage in their academic careers. The main objective of the module is to provide basic Information Technology (IT) literacy skills among students. Basic IT literacy skills equip students with lifelong skills that they will use in their day-to-day life, academic, and work careers (Ranaweera, 2008). The 21st-century student must have these skills to navigate through college without major hassles (Boholano, 2017; Kim, Raza, & Seidman, 2019; van Laar, van Deursen, van Dijk, & de Haan, 2020).

Although many HEIs worldwide have implemented such a module in their pedagogy (Dintoe, 2018; Ranaweera, 2008), the literature regarding the module implementation, challenges, efficacy, and importance as perceived by module lecturers and the students, especially in developing countries context, is scarce. This research aims to fill this gap partly.

Studies have been conducted to investigate measures for the successful implementation of different modules in HE; for example, in Sports and Academic Science (El Massah & Fadly, 2017), Business Studies (Yousef, 2011), Accounting (Barnes, Dzansi, Wilkinson, & Viljoen, 2009; Guthrie, Evans, & Burritt, 2014), System Analysis and Design (Pretorius & Hattingh, 2017), Bioscience (Scott & Graal, 2007), Finance (El Massah & Fadly, 2017), Programming (Durak, 2018) in HE context. While these studies demonstrate the challenges in implementing these modules, literature on the challenges of implementing an introductory module in ICT remains limited. Some studies have also investigated ICT and information literacy trends in schools and universities. Anunobi & Ukwoma (2016) attempted to investigate information literacy trends, challenges, and opportunities in universities. While this research was closer to the subject area of this study, it fails to explain challenges in ICT module implementation in HE. Charalambidis (2014) discusses the importance of imparting 21st-century skills in students but fails to explain how such skills can be imparted to students. Mabunda (2010) explores the benefits and challenges of technology utilisation in the higher education context. However, their study focuses on other measures for appropriating technology in HE but ignores how training students on how to use ICT are fundamental in its adoption. Rana et al. (2020) investigated problems in the introduction of ICT, but their focus was on rural primary schools.

This study adds to this growing literature by examining measures that should be put in place. In this paper, the researcher motivates the importance of an introductory module in ICT, investigates the challenges in its implementation, and solicits opinions on how such a module can be made successful. Ultimately, the study develops a conceptual framework for implementing, assessing, and improving the efficacy of the module as perceived by the module lecturers. It's important to directly digest these issues as they affect students' outcomes (i.e., poor performance in a module can be severe, either denigrating a graduate's final grade or leads to a withdrawal decision among students if they repeatably fail the module). Addressing this question will foster critical 21st-century skills expected of a modern student while simultaneously ensuring higher learning outcomes and achievements amongst students in the particular module. The arguments for the inclusion of information technology in the curriculum are compelling and were summarised in the EDUSummit 2015 by many experts and stakeholders (Webb et al., 2017).

LITERATURE REVIEW

This section reviews the literature on higher education in Zimbabwe, challenges and solutions for ICT integration in HE.

Higher education in Zimbabwe

Higher education in Zimbabwe is offered through three educational institutions: universities, teacher's colleges, and technical colleges (Garwe & Thondhlana, 2018; Hwami, 2011; Mlambo, 2005). Universities offer degree programs, diploma programs, and post graduate studies, i.e., Masters' and Doctorate qualifications. On the other hand, teachers' colleges offer two teaching diplomas: primary education diplomas or secondary education diplomas. The third type of higher education institutions are

polytechnic colleges and other general colleges. These offer various forms of diploma qualifications depending on the speciality of the institution. The goal of these institutions is to prepare students with appropriate skills for their infusion into the industry.

21st Century skills

For students to thrive in this digital age, they require digital proficiencies (Charalambidis, 2014). These digital proficiencies are often referred to as 21st-century skills. Although the term 21st-century skills is still to have a precise definition, the term often refers to those core competencies such as digital literacy, collaboration, problem-solving, and critical thinking expected of students to thrive when they join the workforce (Charalambidis, 2014; Rich, 2010). Stauffer (2020) highlighted twelve abilities students need to succeed in their careers in the information age. These include critical thinking, creativity, information literacy, collaboration, media literacy, technology literacy, leadership, initiative, productivity, social skills, flexibility, and communication. One important skill that continuously emerges in any discussion with regards to 21st-century skills is ICT skills. Therefore, HE must impart such skills to their students in their curriculum regardless of their program.

Importance of ICT competencies within students

Teaching and learning with technology have always been in existence since time immemorial though at a low level (Perienen, 2020). The advent of the computer has accelerated the paradigm shift in teaching and learning with technology (Englund, Olofsson, & Price, 2017). Higher education appears to be on the lead with this transformation (Ghavifekr & Rosdy, 2015). The availability of cheaper yet faster technological devices has yielded hope among educational stakeholders that learning can make a new turn for the better amidst challenges, i.e., the coronavirus pandemic of 2019 (COVID-19) (Espino-Díaz, Fernandez-Camirero, Hernandez-Lloret, Gonzalez-Gonzalez, & Alvarez-Castillo, 2020; Ifijeh & Yusuf, 2020; Lorente, Arrabal, & Pulido-Montes, 2020). Research has shown that students learn better in their different subjects if they use technology (Perienen, 2020). ICTs have become an important tool in maintaining a conducive learning environment with such tools as collaborative platforms, discussion boards, problem-solving capabilities, online support for students, all of which support students' understanding and cognitive growth (Sharma, 2020). Another important role of technology among students is its gigantic contribution to knowledge acquisition, content assimilation, and understanding (Perienen, 2020). Unlike yesteryear students, the modern-day student encounters the need to use ICT skills more than 80% of the time in any typical task given. Without sufficient IT skills, students ultimately face mammoth tasks in accomplishing such tasks and end up either doing it themselves and performing poorly or assigning others to do the task for them. Either way, implications on academic rigour and the quality of learning are negative. It becomes very necessary to then impart IT skills to students early enough in their academic careers. Many scholars are advocating for the skilling of staff and students in the use of (ICTs) for teaching and learning purposes in line with global trends (Charalambidis, 2014; Mabunda, 2010; Perienen, 2020; Pretorius & Hattingh, 2017; Rana et al., 2020; Sharma, 2020)

However, despite the important role that ICTs play in students' careers, access to these technologies for many of them is a great challenge, especially in developing countries (Avgerou, Hayes, & La Rovere, 2016; James, 2005; Lwoga & Sangeda, 2019). This limits the use and appropriation of technology in HE creating different forms of the digital divide (James, 2005; Reynolds et al., 2019; Sharma, 2020). Concrete opportunities, encouragement, and support thus still need to be developed to improve the utilisation of technology by students in HE. One way is to develop a curriculum for HE that mandates all students to compulsorily possess these skills.

Such an initiative is not without challenges, and currently available strategies are inadequate and unsustainable (Rana et al., 2020).

Challenges of appropriating technology in HE

Higher education in developing countries is confronted with many issues concerning technology appropriation. Firstly, many students in HE lack the necessary IT skills as there is no mandatory IT subject in primary and secondary schools to equip students with basic IT skills. Secondly, the cost of ICT related equipment and infrastructure is too high and often unaffordable to many students. This ultimately limits the use of ICTs.

Extant literature on ICT adoption in higher education has highlighted many challenges, i.e. Lack of access to the internet, poor state/unavailability of computers, non-availability of required software, lack of technical support, electricity challenges, limited technical support, and the lack of effective training techniques (Ghavifekr, Kunjappan, & Ramasamy, 2016; Siddiquah & Salim, 2017). Johnson et al. (2016) classified challenges in ICT implementation in education as either external (access constraints, inadequate training, and support constraints) and internal (attitudes and belief, resistance, and skills and knowledge). While some of these challenges can be resolved by channelling capital to institutions, the inclusion of ICTs in the education curriculum can potentially solve many of the challenges identified by Johnson et al. (2016).

THEORETICAL FRAMEWORK

Systems thinking was selected as the theoretical framework for the study. Systems thinking is a disciplined approach for examining problems more completely and accurately before acting (Mella, 2008). It allows us to ask better questions before jumping to conclusions. Systems thinking involves moving from observing events or data, to identifying patterns of behaviour over time, to surfacing the underlying structures that drive those events and patterns (Verhoeff, Knippels, Gilissen, & Boersma, 2018). By understanding and changing structures that are not serving well, we can expand the choices available to us and create more satisfying, long-term solutions to chronic problems. In general, a system thinking perspective requires curiosity, clarity, compassion, choice, and courage. This approach includes the willingness to see a situation more fully, recognise that we are interrelated, acknowledge that there are often multiple interventions to a problem and champion interventions that may not be popular.

Systems thinking was the choice because of its ability to expand the range of choices available for solving a problem by broadening our thinking and helping us articulate problems in new and different ways.

OBJECTIVES AND RESEARCH QUESTIONS

The overarching aim of this research study is to gather the perceptions and beliefs of ICT lecturers regarding the implementation of a university-wide introductory module in ICT in HE. We argue for establishing and implementing such a module based on the belief that it will add value to HE students by equipping them with key 21st-century competencies such as information literacy skills, communication skills, and technology literacy. Ultimately, we develop a framework for successfully implementing such a module to benefit other institutions that are yet to implement it.

- 1) Why should institutions implement a mandatory ICT module for all students enrolled at an HEI?
- 2) What challenges may such an implementation incur?
- 3) How can such challenges be resolved so that students can reap greater benefits from the module implementation?

RESEARCH METHOD

Research philosophy

This research adopts an interpretative research philosophy. Interpretivism drives by the works of Kant, Webber, Dilthey, Lincoln, Guba, and Crotty. The main ontological and epistemological assumptions are those of relativism and subjectivity, respectively. In interpretivism, knowledge is created by examining and understanding “the social world of the people being studied, focusing on their meanings and interpretations” (Ormston, Spencer, Barnard, & Snape, 2007). Meanings and knowledge are usually constructed and grounded in participants’ experiences. Constructs are elicited & understood through interactions between researcher and participants (Ormston et al., 2007). Usually, qualitative research methods such as interviews are used to solicit information among participants. A case study for Zimbabwe, a lower-middle-income economy located in Sub-Saharan Africa, will be adopted for the study. A case study design is an approach that permits conducting of research involving investigating phenomena based on a specific context using multiple sources of evidence (Robson, 2002; in Saunders, Lewis, Adrian, & Thorhill, 2016). The case study strategy offers an ability to answer the what, why, and how questions and is often used in an exploratory study (Saunders et al., 2016).

Sample

Purposive sampling was used to select all ($n = 10$) lecturers teaching an introductory module in information communication technologies at an HEI. The reason for selecting these was premised on the assumption that the experience attained in the module's teaching would be valuable in identifying critical success factors for the future implementation of such a module in other HEIs. The reason for only selecting lecturers for this study was based on the assumption that they are key in the transformational processes in Perienen (2020) reemphasised this, claiming that no paradigm shift in the educational process can be successfully envisaged without teachers being involved in the process.

Table 1. Demographic Data of Participants

		n
Gender	Male	6
	Female	4
Age	25-30	2
	31-35	3
	36-40	4
	41+	1
Highest Education Qualification	Honours Degree	0
	Masters' Degree	9
	PhD	1

All the selected respondents agreed to partake in the study yielding a 100% response rate. Sixty 60% of the respondents were males, while 40% were females. All respondents were holders of a master's degree in information systems or Computer Science and had more than 2 years of teaching experience at an HEI. This information is tabled in Table 1 above.

Data collection

The data collection technique that was used in this study was in-depth interviews. In-depth interviews are when one interviews someone to obtain detailed answers beyond the initial surface-level answers. At least 30 minutes sessions were organised between August to December 2020, in some cases sessions being repeated when necessary, especially if analysis of the results was unsatisfactory. In-depth interviews have the advantage of giving interviewers opportunities to ask follow-up questions to generate a richer understanding of the matter being discussed. The main focus during the interviews was on participants' views on the introductory module in ICT, the challenges they experience that makes it difficult for the module implementation to be met, and possible solutions they envisaged.

Data Analysis

Even though qualitative research continues to be increasingly valued and recognised throughout research circles, it remains important to undertake it methodologically and rigorously for useful and meaningful results to be achieved (Nowell, Norris, White, & Moules, 2017). In our study, data collected from the interviews were coded and analysed using thematic analysis. Nowell et al. (2017) describe thematic analysis as a method for identifying, organising, describing, and documenting themes emerging within a set of data. Thematic analysis is a technique that identifies recurring ideas that prop up in interviews. The thematic analysis is an iterative process that cleans up data to map the most important ideas/themes in the data. Six steps were followed to achieve this, with the first step being to familiarise the obtained data. Preliminary codes will then be assigned to emerging themes in the data. The next step will be to search for the patterns of themes across all interviews conducted. The themes will be reviewed if need be based on the data being analysed. The themes will then be defined, and the results will be documented in the results and discussion section.

FINDINGS

They all concurred with the importance of Information Technology skills to the 21st-century student. Six were part of the team that developed the module at its inception in 2014 at the HEI. Initially, participants were asked about their perceptions about the introductory module in ICT and whether the module implementation lived to their expectations. All responses were affirmative concerning the importance of the module. Seven respondents felt more had to be done for the module's objective to be successfully realised, while three (30%) felt the module had lived up to their expectations though they agreed that more could be done to improve the module offering.

...it's a good module that has the capacity to enrich students with important skills expected of a modern-day student...but of course as in any case there are challenges that have to be worked on for students to continuously benefit from this...

The respondents agreed that the module was formulated to impart IT skills among students, as is the norm in many educational institutions worldwide. The current information society requires students to possess ICT skills to survive their academic careers and their future work careers (Pradhan, 2017; Rana et al., 2020).

.... ICT skills are the next basic human rights needs after things like water and shelter. Everything is now online and without basic IT skills accessing basic commodities is likely going to be a difficult question in the foreseeable future...

The module is intended to equip students on the basics of technology, i.e., how to use a computer and use basic software like MS Word, spreadsheet, and information retrieval. Skills acquired from this module are life skills that can assist students in their pursuit of lifelong learning. Students are also trained on basic technology such as networks, the internet, and email. They also get to know about computer and data security which are key issues in this Information Age.

...we want to instil an idea of IT dependency among the student population. One way to do that is to design a curriculum that advocates for the use and demonstrates the importance of ICT in a students' journey. The student is supposed to have both theoretical foundations as well as practical abilities in the use of information communication technologies...that is what this module is basically all about...

Participants were then asked about the challenges that impeded the successful attaining of the modules' objectives and described how such challenges could be addressed. Eight key points emerged from the study, and these were used to frame the conceptual framework.

One of the greatest challenges that all respondents emphasised was the issue of large class sizes. As institutions try to manage costs such as employment costs, the massification of common modules is quite common (Foley & Masingila, 2014; Guthrie et al., 2014; Maringe & Sing, 2014; Pretorius & Hattingh, 2017). This is a scenario whereby institutions combine different groups of students to form one class. While this is a well-conceived idea, especially for modules that do not necessarily require close supervision, it poses a great challenge in introducing ICT classes for several reasons. Firstly, combining different students undertaking different courses into a single course brings the challenge of diversity. Students coming from different backgrounds will require different kinds of attention, so the idea of combining them has the effect of subduing others. Secondly, failing to give adequate personal assistance to all students if class sizes are too big. This is supported by Foley and Masingila (2014) who claim that big classes impede students' opportunities to interact with the teacher and their colleagues and get feedback timeously.

...The class sizes are just too big and unsustainable...you end up being like a preacher in a church...this module requires close supervision and monitoring to ensure that students are grasping the concepts. With some groups currently having over 200 students it's just not possible to move around the lab and attend to all students in the given time period ...

Furthermore, another respondent added that:

... the class sizes are currently too big... it's so easy to lose the attention of many during lesson time... other students end up not even participating in the class as they feel ashamed just in case they respond in a wrong way. In some cases, you can't even move around in the class as there isn't any class... I would suggest a class size that equate to the number of computers in the computer lab and of course there should be lab assistant to

help students during and after lesson time especially for bigger groups of more than fifty...

Extant literature has highlighted that large classes are increasingly becoming common in HE and result in increased pressure on staff and institutions, ultimately impeding the attainment of quality education (Foley & Masingila, 2014; Labuschagne & Burger, 2017; Yelkperci, Namale, Esia-Donkoh, & Ofosu-Dwamena, 2012). Large class sizes offer opportunities for absenteeism among students as it becomes difficult for the lecturer to identify who is present or not (Labuschagne & Burger, 2017). This, in turn, negatively affects retention rates among students. The recommendations proposed were that classes should be broken down into smaller and manageable classes. The number in each class is determined by the computer laboratory's nature and availability of teaching assistance.

Inadequate requisite physical infrastructure was another key issue that arose as a significant issue regarding offering the ICT course. All respondents concurred that physical infrastructure like properly equipped computer labs and well-resourced libraries are fundamental in successfully deploying ICT courses.

...Having proper physical infrastructure is key for the success of this initiative... I mean infrastructure like fully equipped computer labs...yes, there should be fully furnished computer labs for this to work. You can't teach students about ICTs in an ordinary classroom and expect them to take it seriously...

Therefore, institutions should be fully equipped with adequate infrastructure that is easily available and accessible to students anytime they require it.

Another challenge that respondents cited as an impediment to successfully offering an ICT module is limited technological infrastructure. Charalambidis (2014) highlighted that several ICT tools such as internet access, learning management systems, computers etc., should be readily available to provide students with significant 21st-century skills. One of the main objectives of offering this module is to equip students with IT literacy skills so that they can be able to utilise technology for their greater benefit efficiently. Yet, the high costs associated with IT gadgets prohibit students' ownership of these. Therefore, it makes sense for HEI to channel greater funds to investments in IT equipment. Such equipment and infrastructure may include computers, internet connectivity, conducive electronic environment, i.e., availability of constant power. Training students about the importance of technology without the available technology is likely to be futile; hence, HEIs are recommended to avail these to students. While these computers can be housed in a computer lab, institutions can fund these students' acquisition for those who do not have and gradually add the cost of such acquisitions on student's fees. These have the potential of appropriating technology in HE.

...without basic technology like computers, internet connectivity, constant power etc, teaching the module is likely to be a mammoth task.at an institution computer

Another challenge that respondents identified is the negative attitude that some students have on the module. In many cases, students presume that since the module is not directly related to their program, it's not important. Yet, for students to truly conceive concepts being taught in a module, they should have a positive attitude towards the module (Cornford, 1997; Hofstein & Mamlok-Naaman, 2011). Students' attitudes have to be moulded to appreciate the importance of any module in their curricula. One way is by explaining the objectives of the course and its importance in their careers. Previous studies have shown that university-wide courses such as gender studies or culture and heritage studies that are imposed on students have low pass rates compared to main subjects being undertaken by students (Cornford, 1997; Dejene & Chen, 2019; Ouahada, 2019).

...many of the students have an "I don't care attitude" when it comes to the ICT module.... they outsource coursework and rarely attend lectures only to perform dismally in the module... they say for example I am training to be a teacher not a technology expert thereby taking the subject for granted...

Another respondent had this to say;

...you might give students tasks to do but you will not fail to find one or more student who asks other 'technically strong' individuals to do the tasks for them. With experience and through the use of such tools as plagiarism/similarity detectors it's easy to identify this...once you ask them about it, they will give you many excuses. The objective for learning the module in this case gets lost and it becomes complex to fairly assess the students.

While not necessarily a challenge, respondents highlighted that continuously updating module content to keep abreast with key technological trends is key in ensuring that module implementation’s objectives are realised. Charalambidis (2014) supported this, who noted that proper educational content is key in providing adequate IT skills students.

...obviously we need to keep updating our curricula and module in line with technological trends. For example, you can’t tell students about a floppy disk as a storage device because that quite outdated and the current student will probably not see any in their lifetime. We just have to update our material and notes by adding new technologies and subtracting old things. On storage devices for example I would discuss new technologies such as cloud technology etc...

Another important point raised in the discussion is the alignment of module content with students’ subject areas. Students understand concepts better if the concepts are aligned to their knowledge domain. HE students are typically from diverse backgrounds (education and culture wise). Yousef (2011) highlighted that field of study affected performance in a certain module. Offering different groups similar module content and context is likely going to be problematic. Rather module content has to be tailor-made to suit the subject area for each particular group of students. An accounting student will benefit from an ICT course if concepts such as accounting information systems or such are discussed in the module. An education student would probably not find that information useful to them, yet the students would greatly appreciate discussing concepts such as learning management systems and e-resources etc.

...you have to be very cunning if you want to draw students’ attention in an ICT class...remember this course is done by all and sundry...some with no IT experience at all. Tailor suiting content to align with subject area will probably do the trick...Going in too deep though probably necessary might confuse the less IT capable students who are probably the majority in a class...

Another opportunity that could be utilised to improve the objective of the module implementation identified in the empirical study was continuously offering short term courses and workshops to both students and staff. While the major goal for implementing an introductory module in ICT is to equip students with IT skills, it’s not guaranteed that students will grasp all the concepts in a single semester. Pressure for the exam might also lead students not to put much effort and do the module for the marks (Blazar & Kraft, 2017; Ouahada, 2019). However, continuously and frequently offering short term courses and workshops can potentially reinforce concepts learnt earlier. Even lecturers themselves need continuous training and retraining to keep abreast with technology to incarnate a culture of ICT dependency among their students.

Figure 1 below shows the conceptual framework for implementing and assessing an introductory module in Information and Communication Technologies in higher education based on the study.

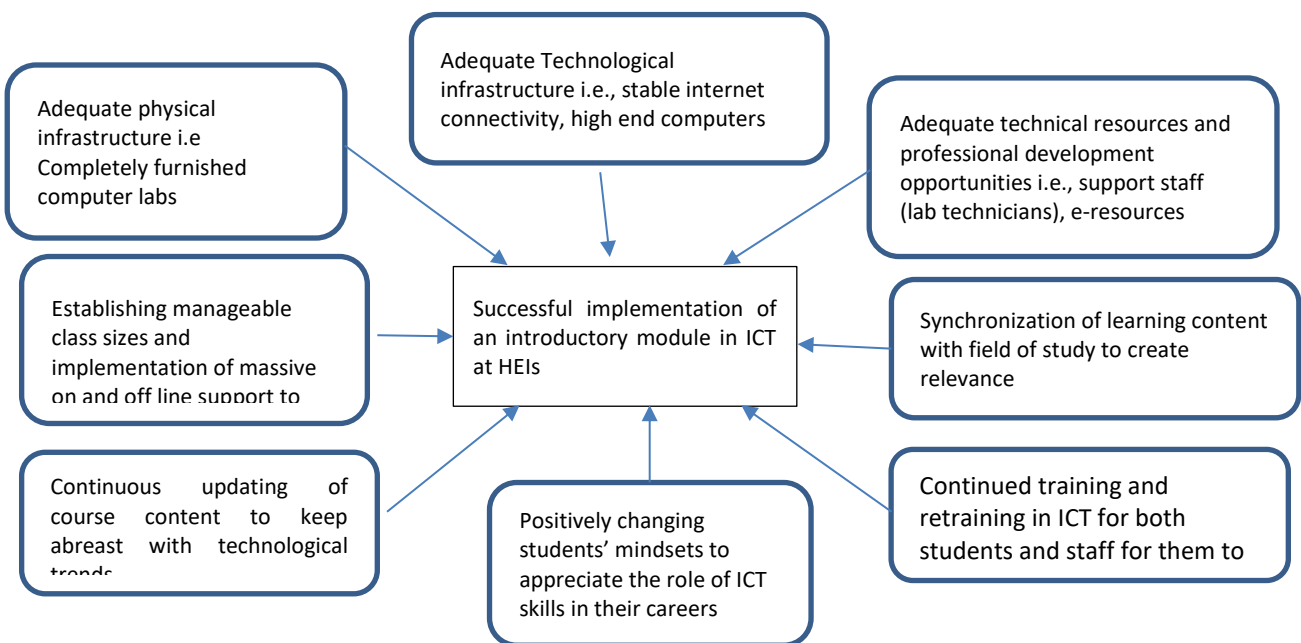


Figure 1. Proposed Conceptual Framework for Implementing and Assessing an Introductory Module in Information Communication Technologies at HEIs (Author’s Work)

CONCLUSION

The participants all reiterated the importance of an introduction to information communication technologies module early enough in any academic programmes at HEIs as it equipped students with some key 21st-century skills. However, such implementations are not without challenges and several important aspects have to be observed and addressed for successful deployment of the module. From the discussions held with the participants, it was observed that the module positively affected students. One key observation from the empirical study was that negative perceptions regarding how they had to be changed view some student's perceptions of the module. Further studies on how this can be achieved can be a good area for future research.

This paper developed a conceptual framework for implementing and assessing an introductory module in ICT. The developed framework will also need to be tested and validated in other HEI settings as the data was gathered at only one HEI.

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