ICT policy implementation in higher education institutions in Namibia: A survey of students' perceptions

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Abstract

The purpose of this paper is to analyse the factors that affect the perception of the implementation of the ICT policy in education in the empirical context of higher education in Namibia from a students' perspective. The paper explains the current situation regarding ICT policy in higher education in Namibia. There are no studies that could be found to have measured these factors in a developing country in Africa. A quantitative approach was followed in this study. Data were collected using a structured questionnaire and were analysed by means of descriptive statistics, exploratory factor analysis and multiple linear regression analysis. The perception of the implementation of the ICT policy in higher education in Namibia is affected mostly by lack of ICT literacy and limited access to learning and training content. Some of the challenges from past studies were also reconfirmed in this study, though they were investigated in a different context. This study also identified new challenges that affect the perception of the implementation of ICT policy in higher education, specifically from a developing country context. The findings in this study should be confirmed by further research to help developing economies evaluate their ICT policies in education and their outcomes.

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1 Introduction

Information and communication technology (ICT) is a critical component that influences learning experiences in higher education contexts (Gil-Flores et al. 2017; Isaacs et al. 2018; Zweekhorst and Maas 2015) and has led to the increased use of "laptops, phones and tablets" (Zweekhorst and Maas 2015:2) as part of teaching and learning resources. Based on this, ICT is increasingly becoming an important tool for learning in both developed and developing countries (Gil-Flores et al. 2017; Tondeur et al. 2007). In recent years, ICT has attracted a lot of academic interest, and many scholars have investigated the role that ICT plays in higher education (Zweekhorst and Maas 2015). Higher education institutions (HEIs) as part of their response have increased their budgets on ICT (Gil-Flores et al. 2017:441), ensuring that there is availability of computers and stable internet connections in the classrooms.

The use of ICT in higher education (HE) is regarded as an important tool that is crucial in creating dynamic, collaborative and innovative learning environments (Vanderlinde et al. 2012). Chowdhury (2019) notes that ICT "has great potential to support innovative pedagogies" that are important in enhancing student learning experiences. It is argued in the literature that by simply using technology in the classroom, students become more motivated and creative (Blignaut et al. 2010). However, the use of ICT in order to enhance student learning and creativity in developing countries is somehow limited due to a number of barriers that hinder the integration of ICT in higher education (Bingimlas 2009). These barriers are classified in literature as extrinsic (i.e. institutional –level barriers) and intrinsic (i.e. individual-level) barriers) (Bingimlas 2009; Hanus and Fox 2015). However, these barriers are yet to be identified as the factors that higher education students perceive as factors that affect the successful implementation of national ICT policies in higher education.

Globally, most governments are investing heavily in ICT as part of the broader higher education support (Hanafizadeh et al. 2019). This resulted in many countries progressing in terms of the implementation of ICT initiatives (Hanafizadeh et al. 2019). ICT is, therefore, an important foundation for the millennial students (Picatoste et al. 2018), especially for learning, specifically in an environment that is increasingly becoming disruptive. The implementation of ICT initiatives by governments of developing countries are done to enhance public sector efficiency and socio-economic development (Davies et al. 2017; Hasan 2016; Hanafizadeh et al. 2019). However, oftentimes, these outcomes are not achieved in the context of developing countries (Hanafizadeh et al. 2019) and most are not investigated in order to determine how implementation can be improved. The failure to achieve the intended outcomes of investing in ICT has motivated a number of studies (Dada 2006; Heeks 2002).

Namibia developed an ICT policy for education in 2005, and the implementation plan in 2006, but research measuring the perceptions of higher education students regarding the implementation of the policy is limited. Existing studies on ICT policy in education in Namibia have focused more on secondary schools (Ngololo et al. 2012; Osakwe et al. 2017), leaving the perceptions of ICT policy implementation using university students, largely unexplored (Table 1). Higher education students are critical stakeholders and their perceptions of the implementation of the ICT policy is therefore crucial for evaluating the success of the policy. Perceptions of students are used in this study as a proxy for success because students could be useful and knowledgeable inside

Table 1 Prior research on ICT in education in Africa

No	Title and focus	Authors	Focus area
1.	Using future research methods in analysing policies relating to open distance education in Africa.	Makoe (2018)	Policy analysis in distance and online education
2.	Challenges of information communication technology policy implementation in rural South Africa	Chisango and Lesame (2017)	ICT policy regulation and implementation in rural areas, data collected from high school learners
3.	A decade of LMS acceptance and adoption research in Sub Sahara African higher education: a systematic review of models, methodologies, milestones and main challenges	Bervell and Umar (2017)	Challenges of ICT adoption
4.	Defying ideological misconceptions through information and communication technology localisation in higher education	Ndimande-Hlongwa and Ndebele (2017)	Misconceptions about ICT integration in higher education and African languages
5.	Technology enhanced teaching and learning in South African – a rear-view of a 20-year journey	Ng'ambi et al. (2016).	Review of ICT integration in education
6.	The use of electronic information services by undergraduate nursing students at the University of Namibia's Northern campus: a descriptive study	Ndinoshiho (2010).	Use of electronic services by undergraduate students
7.	An evaluation of the implementation of the National ICT Policy for Education in Namibian rural science classrooms	Ngololo et al. (2012)	ICT policy implementation in rural schools
8.	An Evaluation of the National Information Communication and Technology (ICT) Policy at the University of Namibia in the Faculty of Education	Isaacs et al. (2018)	ICT policy evaluation from the perspectives of educators
9.	Third-year students' perceptions of the use of ICT at a teacher training college in Namibia	Chainda (2011)	Students perceptions of ICT usage
10	Where learners' and teachers' perceptions on mobile learning meet: A case of Namibian secondary schools in the Khomas region	Osakwe et al. (2017)	Mobile learning in secondary schools

informants regarding the implementation effectiveness of the ICT policy. Students use ICT in their interactions with lecturers and tutors, thus, the students' perceptions were used as a proxy for success in this study because they are the intended beneficiaries of the ICT policy in education. Thus, their perceptions of the successful implementation of the ICT policy as consumers of the higher education services is therefore crucial and should be investigated.

In a study conducted in South Africa, it was found that there is no national policy framework regarding the role ICT plays in higher education (Cross and Adam 2007). On average, literature that analyses the perception of implementation of the ICT policies in developing countries is limited (Hanafizadeh et al. 2019; Makoe 2018),

specifically in higher education contexts (Cross and Adam 2007; Czerniewicz et al., 2006; Isaacs et al. 2018; Rizza, 2011). To the best of our knowledge, Chainda (2011) and Isaacs et al. (2018) are a few studies that could be found to have analysed the Namibian ICT policy in higher education contexts, however, their focus has been on educators (Isaacs et al. 2018) and the general effect of ICT application on learning and skills acquisition (Chainda 2011). Students' perceptions regarding the factors that affect the successful implementation of the national ICT policy in higher education is yet to be sufficiently evaluated, and this forms the basis of this study.

Government's role in the success or failure of national policies, especially in ICT is beginning to emerge (Hasan 2016). Kim et al. (2015) argue that policy evaluation ICT is of strategic importance because it is a necessary platform for refinement of existing policies. Thus, this study considers the measurement of students' perceptions important because it forms the first level of policy evaluation that could be useful in refining the current implementation plan of the ICT policy in education in Namibia. However, there is a general scarcity of studies that have assessed the outcomes of ICT related policies in developing countries (Choi et al. 2016; Mansell 2014), including Namibia. Studies that have attempted to evaluate ICT policy have predominantly focused on diffusion and adoption (Hanafizadeh et al. 2019), with a dominant focus on secondary schools (Ngololo et al. 2012; Osakwe et al. 2017) compared to university contexts in Namibia, specifically the perceptions of implementation of the policy.

Based on this significant gap, the aim of the paper is to evaluate the factors that could be affecting the perception of the implementation of the ICT policy in the context of higher education. These factors should be considered as a main slate for a deeper evaluation of issues regarding the actual implementation of the ICT policy. Using primary data collected from university students in Namibia, the present study seeks to answer the following research questions: do higher education students perceive the implementation of the ICT policy as successful? What are the factors affecting the perception of the implementation of the ICT policy in higher education?

The research contributes to the literature on ICT policy evaluation in developing countries by highlighting the perceived factors that are affecting the successful implementation of the ICT policy in Namibian higher education. It is important to note that very few studies have been published on higher education in Namibia using student perceptions as the primary source of data. The research aimed to offer a slate upon which the evaluation of the ICT policy research could be built from, and possible recommendations on the directions of future studies.

2 Literature review

2.1 Namibian ICT policy in education

In 1999, Namibia first introduced its national ICT policy for education (Ngololo et al. 2012) which was then revised in the year 2005 (Ministry of Education, 2005). In the revised ICT policy, education was deemed to be an important sector for capacity development in Namibia (ICT Policy, 2006). As a result, "the education sector has fashioned the ICT policy for education to boost the use and development of ICT in

service delivery particularly in education and vocational training" (Osakwe et al. 2017:17).

According to the policy, ICT is defined as:

"all the technologies used for handling and communication of information and their use specifically in education. These include computers, audiovisual systems, broadcast receiving systems and telecommunication systems, media such as compact discs and videodiscs, microcomputer-based laboratories, the Internet, virtual learning centres, local and wide area networks (wired and wireless), instructional software, printed media, educational television, voice mail, e-mail, satellite communication, VCRs, cable TV, conventional and interactive radio" (ICT Policy, 2005:4).

The broad aim of Namibia's ICT policy in education is to coordinate the appropriate development, efficient delivery and quality use of technology in order to meet the challenges of the knowledge economy (ICT Policy, 2005). In order to achieve this broad aim, 5 major distinct development areas for the use of ICT in education were therefore developed and these include (1) "investigation and development of appropriate ICT solutions; (2) deployment of ICT; (3) maintenance and support of ICT; (4) ICT literacy; and (5) ICT integration" (ICT Policy, 2005: I). In pursuit of these developmental outcomes of the ICT policy in education, the Namibian government through the Ministry of Education (MOE) has been funding the ICT policy in education through the National Budget (Ngololo et al. 2012). Research is yet to measure the factors that could be affecting the perception of successful implementation of the ICT policy in Namibia, using the perceptions of higher education students.

Almost two decades after the launch of the ICT policy in education in Namibia, research shows that its implementation is relatively slow (Osakwe et al. 2017). It is also important to highlight that the impacts of the ICT policy implementation in education remains relatively under-researched (Ngololo et al. 2012), specifically studies that measure the perception of implementation of the ICT policy. These conclusions by previous researchers (Osakwe et al. 2017; Ngololo et al. 2012) show the need for further research to identify the student factors that could be contributing to the perceived slow implementation of the ICT policy in Namibia. The findings of this study could be crucial in helping the country to meet its knowledge economy goals as envisaged in the policy. Existing studies on ICT policy in education in Namibia have predominantly focused on secondary education (Ngololo et al. 2012; Osakwe et al 2017); deployment and maintenance of ICT (Clicherty & Tjivikua, 2005; Matengu, 2006); teacher education and instructors (Isaacs et al. 2018; Ipinge, 2010). Studies that use the perceptions of higher education students to measure the success of the ICT policy implementation are limited. Therefore, there is a need to report findings concerning the perceptions of students regarding the implementation of the ICT policy in order to enhance learning and teaching and improve the implementation processes of the policy. Therefore, this study sought to address this gap and contribute to literature on ICT policy evaluation in developing countries using the perceptions of students.

2.2 Availability of ICT infrastructure

ICT has become an integral part of us (Katz 2017) because it is used in almost all organizations. With advances in ICT, many people now own and use at least one ICT

device in their everyday lives (Ninaus et al. 2017; Vodanovich and Urquhart 2017; Mlotshwa and Giannakopoulos 2016). "It was found that ICT use in the university has positive effects on both students' learning and lecturers' teaching. Benefits, students' response and ICT compatibility/comfort in teaching and learning are all categorized as positive effects. Ease in teaching and learning, access to information and up-to-date resources, online interaction between staff and students, establishing contact with the outside world through exchange of academic work and achieving more in less time are some of the contributions of ICT to teaching and learning as perceived by the students and lecturers"(Adedokun-Shittu and Shittu 2015). Despite the ubiquitous use of other ICT related gadgets in everyday lives and benefits that can be leveraged thereof, educational institutions face shortages of ICT infrastructure (Lwoga 2012), thus affecting the implementation of ICT programmes in schools, specifically in rural areas (Ngololo et al. 2012).

There is a huge variation regarding the quality of ICT infrastructure between urban and rural schools in developing countries (Rubagiza et al. 2011; Ngololo et al. 2012). Previous studies on ICT related aspects in Namibia shows that there is underinvestment in ICT infrastructure (Rukanda and Buckley, 2016). Though the lack of good investment in ICT infrastructure affects the quality of teaching and learning, the lack of it is yet to be reported as a factor regarding the perception of implementation of the ICT policy in Namibia.

African universities are struggling to match increasing demand through the expansion of learning and teaching facilities (Lwoga 2012) due to declining university funding (Woyo et al. 2014). Investing in technology for education is crucial because ICT has a significant impact on the methods of teaching, curriculum and learning processes (Rhema and Miliszewska 2010). Since the launch of the revised ICT policy in 2005, Namibia has been funding the implementation of the ICT policy through its national budget (Ngololo et al. 2012). Thus, it is clear that there is need for universities to ensure there is sufficient investment in infrastructure for ICT education because these technologies are critical for the transformation and support engagement among students (Kinuthia and Dagada 2006; Mlotshwa and Giannakopoulos 2016). However, it is not yet clear whether students do perceive that the slow implementation of the ICT policy reported by Osakwe et al. (2017) could be a lack of funding in Namibia.

Mlotshwa and Giannakopoulos (2016) note that students in higher education can use ICT learning technologies to download study materials, conduct research purposes, and store study materials as soft copies as well as communication via emails and other social media platforms. The use of ICT learning resources is imperative for higher education because it supports flexibility in learning processes (Lwoga 2012), thus allowing students to share, create and re-use study materials (Majhi and Maharana, 2010). Ruiz et al., (2006) argue that the use of ICT in higher education curricula is important as it encourages "lifelong learning" where students can also participate as distributors of learning content together with their lecturers. For this to happen, there is a need for sufficient investment in ICT infrastructure. Based on this, the following hypothesis is suggested:

H_1: Students perceive that the implementation of the ICT policy in education in Namibia is negatively affected by lack of ICT infrastructure investment.

2.3 Digital competency among lecturers

Lecturers are important agents for the successful implementation of policies in higher education contexts. Though lecturers and instructors with a positive ICT attitude exists (Howard, 2013), research show that a great deal of lecturers and instructors are faced with a number of challenges when using ICT in the delivery of lectures (Vrasidas 2015; Ward and Parr, 2010), thus affecting teaching and learning outcomes. These challenges include lack of time, rigid curricula (Vrasidas 2015); digital incompetency (Lindberg et al. 2017) coupled with limited technical ICT support (Vrasidas 2015; Bingimlas 2009; Inan and Lowther 2010; Unal and Ozturk 2012). These aspects could be detrimental in the implementation of ICT policy in higher education and are yet to be reported using the data from the students'perceptions of the implementation of the ICT policy in education in Namibia.

OECD (2010) policy documents show that for instructors and lecturers to use ICT effectively in higher education, digital competence is a critical pre-requisite. The effective use of ICT in teaching and learning is a perennial challenge in higher education because advances in ICT are often rapid (Burke et al. 2018). In addition, Miller and Glover (2010) argue that the use of ICT by lecturers is often affected by a number of factors that include "access, school support, and provision of professional development, attitudes, and technological competencies" (Teo 2014).

The following hypotheses are made:

H$_2$: Students perceive that the implementation of the ICT policy in education in Namibia is negatively affected by the lack of digital competences among lecturers

H$_3$: Students perceive that the implementation of the ICT policy in education in Namibia is negatively affected by lack of support from university management.

2.4 Students' perceptions of ICT in education

The implementation of ICT is considered the primary focus of HEIs in literature (Pate 2016) due to the need to prepare students for a technologically advanced society (Pate 2016; Hanafizadeh et al. 2019; Osakwe et al. 2017). For the purposes of this study, ICT is meant to refer to the use of "computers, audiovisual systems, micro-computer based laboratories, internet and virtual learning centres" (ICT Policy, 2005:4). Studies measuring students' perceptions from the context of higher education students are limited in Namibia, despite the fact that they are the intended beneficiaries of the ICT policy. Many existing studies have measured the attitudes of students towards the use of ICT in classrooms (Sabah 2016; Pate 2016). In these studies, it was found that students have negative attitudes towards the use of ICT due to lack of involvement, motivation and human interaction (Sabah 2016).

It appears there are contradicting views towards the use of ICT in education by scholars. On the one hand, Pate (2016) argue that students are likely to think in a conformed way due to the use of ICT. This is attributed to the way lecturers and teachers use ICT in the classroom, of which many are believed to use ICT in teaching and learning for the purposes of convenience (Pate 2016; Diem 2006). "The use of technology in this instance enhances learning and allows students to 'think with

technology rather than about it'" (Diem 2006, p. 148). On the other hand, the use of ICT in the form of smartphones, for example, has been reported to have a positive impact on students' learning (Philip and Garcia, 2015). Other scholars also concluded that ICT is important for students because it prepares them for work in the new century (Clarke et al., 2013) as it gives them learning motivation (Ciampa, 2014).

Al-Emran et al. (2016) found that students possessing mobile devices that include smartphones and tablets, with an increased level of ICT familiarity were more positive towards the use of ICT in education than the others. However, there are researchers that remains sceptical regarding the integration of ICT into the classroom (Pate 2016; Diem 2006; Beland and Murphy 2016). Generally, students view the integration of ICT in education as a tool that will help them to better understand their studies due to improved access to study materials online and hence acquire improved grades in their studies (Al-Emran, Elsherif and Shaalan, 2016; Mlotshwa and Giannakopoulos 2016; Salomon and Kolikant 2016).

3 Methodology

3.1 Data collection and sampling

A quantitative research methodology was employed to identify the factors that affect the perception of the implementation of the ICT policy in education. Using one university in Windhoek, Namibia as a case study, data were collected using a structured questionnaire (in English). The survey instrument had 3 major sections. The first section collected data on the socio-demographic characteristics of the respondents. Section B of the instrument focused on the students' use of computers and their frequency of use. The last section consisted of questions that measure students' perception of the implementation of the ICT policy in education using 20 5-point Likert scale items rated from (1) totally disagree to (5) totally agree). These items were developed based on a comprehensive review of literature (Gil-Floress et al., 2017; ICT Policy, 2005; Katz 2017; Mlotshwa and Giannakopoulos 2016; Ninaus et al. 2017; Ngololo et al. 2012; Osakwe et al. 2017).

This is the first measurement of perceptions of students at higher education institutions regarding ICT policy implementation. Existing studies on ICT policy and its implementation have been done in the context of secondary schools (see, Ngololo et al. 2012; Osakwe et al. 2017) and teacher educators (Isaacs et al. 2018). A pilot study was conducted among academics and postgraduate students in order to evaluate the measurement efficacy. Based on the outcomes of the pilot study, the survey instrument was further enhanced and revised.

Data were collected between 26 April 2018 and 31 May 2018 from part-time and full-time undergraduate students. Their profile is presented in Table 2. The university has a total of 8000 students. A known population of 8000 requires a sample size of 367 (Krejcie and Morgan, 1970; Malhotra, 2010). We followed this guideline to determine the sample size and eventually, 370 questionnaires were administered. As a result, 226 questionnaires were fully completed, representing 61.1% response rate. Post-graduate students were excluded from the survey because the researchers assumed that they have better access to information technology compared to under-graduate students.

3.2 Data analysis

Data collected were first captured, cleaned and coded using Microsoft Excel 2016 before being exported to Statistical Package for Social Sciences version 24.0 for analysis. Descriptive analysis was performed to determine the profile of the sample (Table 2). Mean and frequency analyses were carried out to summarise descriptive data. Exploratory factor analysis (EFA) was used to identify the underlying constructs of the perceptions of implementation of the ICT policy (Hair et al., 2010). Secondly, EFA was employed in this study for the purposes of data reduction and summarisation (Malhotra, 2010: 636). The Cronbach's alpha coefficient (α) was applied in this study to measure the reliability of the extracted perception of ICT policy implementation factors. The factors had reliability scores that ranged from 0.88 to 0.93, suggesting a high internal consistency and good reliability. Students' perception of the ICT policy implementation factors were further carried out using two tests: the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The adequacy of the factors is supported when the KMO value is between .5 and 1.0 (Kaiser, 1974), of which the study generated a KMO of 0.805. The Bartlett's test was significant ($p = 0.001$). The factor results were then used in the regression analysis. Linear regression analyses were used to test the hypotheses that were made in this study.

4 Results

Slightly more female students participated in the survey (55.3%) compared to male students, with an average age of 25 years. The majority of the respondents indicated that they were studying towards an honours degree (80.5%), and this was followed by those who indicated that they were studying towards the bachelor's degree (17.7%).

Table 2 Demographic variables

Gender	Frequency	% of sample
Male	101	44.70%
Female	125	55.30%
Age		
<19 years	24	10.62%
19–24 years	141	62.39%
25–30 years	48	21.24%
>30 years	13	5.75%
Qualification being pursued		
Diploma	4	1.80%
Bachelor's degree	40	17.70%
Honours degree	182	80.50%
Mode of study		
Full-time	120	53.10%
Part-time	106	46.90%
Most activities are done on the computer	Assignments	

Most of the respondents indicated that they use computers for the purposes of writing assignments, social media chatting, communicating with group members when doing group assignments and projects, designing projects, and gaming. The descriptive results are summarised in Table 2.

EFA was performed in this study on the factors concerning the perception of successful implementation of the Namibian ICT policy in education as a means of identifying a smaller set of variables that can be used for further multivariate analysis. Factors that generated eigenvalues that were > 1 (see Fig. 1) were retained for analysis because a "significant amount of variation in the data could be explained this way" (Field, 2009:647). Factor items that loaded above 0.5 were considered to be correlating with the factor and were therefore retained, and those that loaded below 0.50 were therefore eliminated from the analysis, based on their insignificant correlations with the factors. A few items that cross-loaded on more than one-factor solution were resolved by categorising the item that cross-loaded to where it could best be interpreted. The factor results show that Bartlett's test of sphericity was significant ($p = 0.001$) signifying that the distribution of values in the preliminary measure of the perception of implementation of the ICT policy in the empirical context of the higher education in Namibia was acceptable for conducting the EFA. The study generated a sampling measure that was above the recommended 0.60 (KMO = 0.805) (Carver & Nash, 2011).

The Cronbach's alpha coefficient was also calculated for each factor as a means for determining the internal consistency and reliability of the factors. All the factors generated reliability coefficients that were greater than the recommended 0.60 (Malhotra, 2010:319). This shows that all the scales that were used in this study have adequate internal consistency. A four-factor solution (see Table 3 and Fig. 1) was extracted from the 20 items that were used to measure the factors affecting perception of implementation of the ICT policy in higher education in Namibia from the perspective of the students.
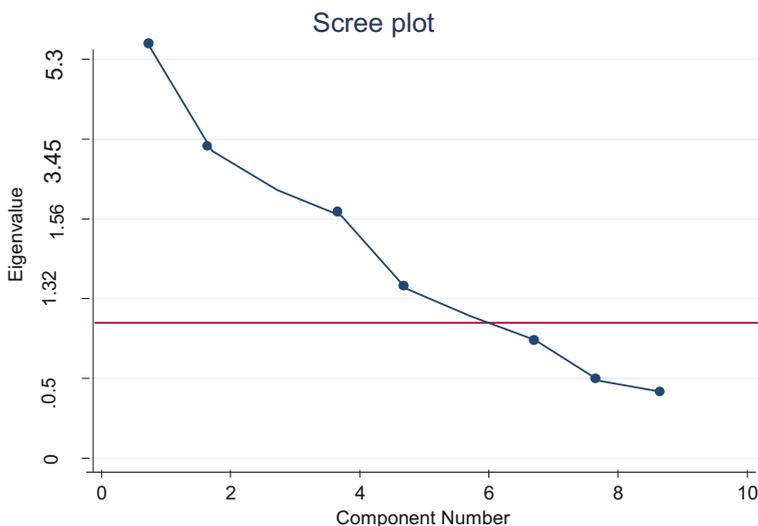

Fig. 1 Scree plot and factor eigenen values

Table 3 Factors affecting the perception of ICT policy implementation

Factor 1: Lack of ICT literacy (α = 0.92)	Factor loading	Variance %	Eigenvalue	Mean
Students and lecturers have low literacy levels	0.76	35.15%	5.03	4.25
Students struggle to integrate ICT in most of their modules	0.73			
Lack of effective training in computer-related subjects by the lecturers	0.68			
Negative attitudes towards ICT related subjects	0.66			
Factor 2: Limited ICT investment (α = 0.90)				
Limited financial resources to buy ICT products like computers, projectors etc.	0.67	16.33%	3.45	3.97
The university has made limited investments in ICT resources	0.65			
Limited investments in ICT infrastructure and materials	0.54			
Factor 3: Lack of commitment (α = 0.87)		9.01%	1.56	3.45
Lecturers are not committed to the use of ICT resources like projectors when delivering lectures	0.81			
The university usually provides limited support in case of technical breakdown for ICT resources	0.61			
Factor 4: Limited access to learning and training content (α = .76)		3.77%	1.32	4.34
Modes of assessment are yet to be digital	0.78			
Limited access to learning and training content on electronic platforms	0.73			
Internet and Wi-Fi connections are rather too slow	0.66			
Some useful materials are usually blocked on the university connection platforms	0.65			
Some web-pages like Facebook are not accessible on campus, despite having subjects that requires such access	0.52			

The first factor was labelled "lack of ICT literacy" and it accounted for 35.15% of the variance, with a reliability coefficient of 0.92. The results showed that the perception of ICT policy implementation in Namibia could be affected by a general lack of literacy among the lecturers and the students. The aspect of digital literacy has been examined in literature as a means for preparing students for the knowledge economy (Gibson and Smith 2018; Tuamsuk and Subramaniam 2017) but not in the context of perception of implementation of the policy. Therefore, this factor is identified as a new factor that influences the perception of implementation of the ICT policy in higher education in Namibia based on the views of higher education students. The effective implementation of the ICT policy in education, therefore, calls for universities in Namibia and other role players to ensure that there is increased ICT literacy levels among lecturers as they are important agents for the implementation of the policy. Recent studies consider digital literacy on part of lecturers to be very important (Tuamsuk and Subramaniam 2017) because they are "responsible for educating citizens who will actively participate in the economic development of the country" and this is one of the Namibian ICT policy's key development outcomes, though it is currently being perceived as unsuccessful due to lack of digital literacy.

Factor 2 was labelled "limited investment in ICT", accounting for 16.33% of the variance, with a reliability score of 0.90. Though this factor has also been discussed in previous studies as one of the key barriers concerning ICT adoption (Peansupap & Walker, 2006), but it is for the first time in Namibian scholarship where it has been identified as one of the factors influencing the perception of implementation of ICT policy in education. This is quite surprising because the government of Namibia has been funding the policy through the national budget since 2006/2007 financial year (Ngololo et al. 2012). A decade of taxpayers' money funding the policy could have been enough to enhance the successful implementation of the ICT policy in education as well as the creation of digitally driven universities, but this is not the case. Further investigation on the role of the national budget regarding the successful implementation of the ICT policy in education could be beneficial to both the intended beneficiaries, the taxpayers and the government. The third factor was labelled lack of university commitment and it accounted for 9.01% of the variance with a reliability score of 0.87. There is no literature on the implementation of the ICT policy that could be found to have identified this as a factor that could influence the perception of effective implementation of ICT policies in higher education. The last factor was labelled "limited access to learning and training content", a factor that could be directly related to the first factor, which is also surprising given that the ICT policy in Namibia has an implementation plan that is more than a decade old. This factor was explained by 3.77% of the variance with a reliability score of 0.76. The factor results are summarised in Table 3.

The respondents (students) attached a varying degree of importance to the four major factors that are perceived to be affecting the successful implementation of the ICT policy in higher education in Namibia. The analysis of results show that students view limited access to learning and training content as one of the key factors ($\bar{x}$ 4.34) that could be affecting the perception of successful implementation of the ICT policy in higher education, thus affecting the success of the developmental outcomes of the policy. The lack of ICT literacy among lecturers and students emerged as the second most important factor ($\bar{x}$ 4.25) that students think could be affecting the perception of the successful implementation of the ICT policy in education in Namibia. It is imperative that higher education institutions increase the level of ICT literacy among lecturers and students because both are crucial for the economic development of Namibia. This could also be helpful in dealing with the challenges that are presented by the factor on limited access to content needed for teaching and learning. ICT policy in education implementation was perceived as weaker in the empirical context of Namibia due to lack of resources that are crucial in supporting the integration of ICT in education. It was mentioned that most of the times students have no access to Wi-Fi, and this is usually experienced the whole academic year. The investment in ICT facilities that include fibre-optic and the expansion of the bandwidth were mentioned among other items that students perceive as affecting interconnectivity on campus, thus limiting their access to learning content. This factor emerged as the third most important factor ($\bar{x}$ 3.97) that could be affecting the perception of the successful implementation of the ICT policy. Therefore, the results show that with increased investment in ICT infrastructure, it is perceived that the ICT policy will be successfully be implemented in HEIs in Namibia.

Table 4 shows the correlations among the dimensions that were used in this study. All the correlation scores are less than 0.80 and this indicates that there are no multicollinearity concerns.

Table 4 Correlations of the factors

Factors		1	2	3	4
1	Lack of ICT literacy	1	.374**	.239**	.027
2	Limited ICT investment		1	.387**	.230**
3	Lack of commitment			1	.186*
4	Limited access to training and learning content				1

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

Further analyses were carried out by means of multiple linear regressions (Table 5). Data that were used in computing multiple regression results were first checked for multicollinearity and it was found that there was no variable that could be predicted with a higher degree of accuracy. The results generated an overall multiple R squared of 0.683 and was statistically significant ($p < 0.001$) with an adjusted R^2 of 0.485. Perception of the implementation of the ICT policy was entered in this study as the continuous dependent variable for multiple linear regression analyses. The independent variables that were employed for analysis include factors that were identified in the EFA results, that is, lack of ICT literacy, limited ICT investment, lack of commitment and limited access to learning and training content. The lack of ICT literacy, lack of commitment, limited access to learning and training materials were all significant in the equation. Regression results are summarised in Table 5.

The regression results show that lack of ICT literacy, limited investment in ICT infrastructure and lack of commitment are statistically significant in explaining what could be hindering the perception of the successful implementation of the ICT policy in education in Namibia's higher education. Lack of ICT literacy is the most significant predictor of why the perception of the successful ICT policy implementation among university students in Namibia remains weak ($\beta = .731$; $p < .000$), and based on this finding, H_2 is therefore supported. The successful implementation of the ICT policy would, therefore, require a concerted effort by universities and role players to increase the level of ICT literacy among lecturers and students. Further analysis of the results show that the perception of successful ICT policy implementation in Namibian higher education is believed to affected by the limited investment in ICT infrastructure that

Table 5 Multiple regression results

Predictor variable	Beta	t	Sig*.	Collinearity statistics	
				Tolerance	**VIF**
Lack of ICT literacy	0.731	20.798	**0.000**	0.919	1.089
Limited ICT Investment	0.045	1.144	**0.027**	0.822	1.216
Lack of commitment challenges	0.020	0.594	**0.035**	0.780	1.283
Access to learning and training	0.055	1.717	0.109	0.811	1.234

*statistically significant at $p < 0.05$; perceptions of implementation as a dependent variable

include fibre optics and the expansion of network bandwidth to take care of the growing student population. The limited investment in ICT infrastructure is the second most significant predictor of why the ICT policy implementation in Namibia is perceived as relatively slow and unsuccessful ($\beta = .0450$; $p < .0027$) by university students, who in this case are the intended beneficiaries of the policy. This as earlier discussed is surprising because the government has been through the national budget been funding ICT investments in education since 2006/2007 financial year (Ngololo et al. 2012). If universities in Namibia are to be perceived as effectively implementing the ICT policy in education, there is need for a deliberate increase in terms of ICT infrastructure investments especially in resources such as network and fibre-optic, which are necessarily regarded as the backbone for wide area networks, that will be aimed at enhancing connectivity among university students. Based on this finding, H_1 is therefore supported.

Further analysis of regression results show that the perception of the ICT policy implementation is believed to be affected by lack of commitment from university management ($\beta = .0020$; $p < .0035$) despite the strategic university documents say that the institution aims to become a global hub of ICT training and development. This finding partially supports H_3 that says that students perceive that ICT implementation is affected by lack of support that include technical support. It is impossible to get technical ICT support if the university management is not committed to ICT investment in teaching and learning. This is further exacerbated by lack of ICT literacy that has been identified in this study.

5 Discussion and conclusions

The aim of the paper was to evaluate the factors that could be affecting the perception of successful implementation of the ICT policy in education in the context of higher education in Namibia, especially from the students' perspective. These factors should be considered as a main slate of issues for future research when intending to explore the deeper evaluation of the actual implementation of the ICT policy. Data were collected by means of a quantitative methodology that followed an exploratory design. The researchers analysed data using descriptive and inferential analysis. From the analysis of the results, the following key findings were evident. Firstly, studies that have measured the perception of implementation of ICT policies in higher education are lacking. Secondly, factors regarding the perception of the successful implementation of the ICT policy in education in Namibian higher education were identified. These factors include lack of ICT literacy, limited ICT infrastructure investment, lack of commitment and limited access to learning and training materials that are necessary for the ICT policy to meet its developmental outcomes. The limited access to learning and training materials as well as the lack of ICT literacy were found to be the most important perception of successful implementation factors.

The effective integration of ICT into curricula requires improved access to learning and training content (Trevor Gerhardt and Mackenzie-Philps 2018; Frischknecht 2018). Analysis of the results shows that students believe that the perception of the successful implementation of the ICT policy in higher education is perceived by university students as being affected by the limited access that they have to learning and training

materials. This is sometimes affected by lack of connectivity to Wi-Fi and poor bandwidth especially in cases where lecturers choose to upload their teaching materials. As a result, in order to influence the perception of the successful implementation of the ICT policy in higher education, it is imperative that universities be able to improve aspects concerning connectivity through a deliberate investment in fibre optics and network as this enhances the ease at which both students and lecturers are able to access training and learning content. This can be achieved through an increase in the university's ICT investment budget to supplement the national budget that has been funding the ICT policy since 2006.

Students argue that the perception of successful implementation of the ICT in higher education is weak due to lack of ICT skills among lecturers. Though this factor is consistent with the existing literature (Trevor Gerhardt and Mackenzie-Philps 2018; Papanastasiou and Angeli 2008; Livingstone 2012), it is not widely found in studies that have evaluated the perception of implementation of the ICT policy, specifically from developing countries using primary data collected from university students. The perceived lack of digital skills, therefore, affects the quality of graduates that are expected for the knowledge economy and thus affecting the developmental outcomes of the ICT policy in education in Namibia. Without digital skills and knowledge, it is very difficult to integrate ICT in teaching and learning in developing countries, and this further explains why there is limited investment in ICT infrastructure in higher education in Namibia. Therefore, the study concludes that based on the findings, the perception of ICT policy implementation is generally affected by lack of skills that are required in ICT environments in higher education and limited ICT investment. These findings are therefore crucial in terms of what needs to be addressed in order for the ICT policy to be perceived as being successfully implemented in the context of Namibian higher education by university students as intended beneficiaries.

5.1 Practical implications

This study provides a significant number of practical implications that can be used by educators and managers of higher education institutions, especially from a developing country context. The general lack of ICT literacy is acknowledged in this study as a factor that affects the perception of the implementation of the ICT policy. This can be improved through capacity building platforms that could include training, for both the lecturers and the students. These trainings must be delivered thoroughly and objectively in order to influence the effective integration of ICT and subsequently improve the perception of successful implementation of the ICT policy in education. More importantly, universities must take a deliberate approach towards influencing lecturers to adopt ICT as part of their delivery methods if Namibia is to achieve the development outcomes that are outlined in the ICT policy.

There is need for support from university management if the perception of successful implementation of ICT policy in higher education in Namibia is to be positively viewed by university students. Lack of support is documented in literature as one of the challenges that affect the adoption of ICT (Wikan & Molster, 2011; Rabah 2015) and has been identified in this study concerning perception of implementation of ICT policy. This can be achieved by ensuring that all university curricula has an ICT component, and this could also be helpful in dealing with the attitudinal challenges

that often emerge. When ICT is integrated with the curriculum, both students and lecturers will be able to have a clear plan for its usage in delivery learning outcomes. This can be further be improved by means of increasing the ICT investment budget, especially concerning the ICT platforms that are directly linked to teaching and learning. Based on this, the governments, especially of developing countries have responsibilities in terms of providing enough budgetary support for the purposes of enhancing ICT infrastructure and investment in training of human resources. The study is also crucial in that it must help policymakers to see how best the current policy and its implementation mechanisms can be revised and improved in order to achieve the envisaged developmental outcomes.

5.2 Limitations and directions for further studies

Data that was used in this study were collected from only one university and further research is required from other universities to confirm this study's perceived factors affecting ICT policy implementation in Namibia. Additionally, the unit of analysis on this study only focused on the students and this limits the generalisability of the findings. Future studies must also include the views and perceptions of lecturers and other university stakeholders in order to arrive at generalisable conclusions. Other methods of data analysis can also be used in the future, for instance, confirmatory factor analysis and structural equation modelling.

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