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Education Management Information Systems in the Digital Age: *Negotiating a Paradigm-shift for Cameroon State Universities*

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ABSTRACT
The performance of an institution to achieve its goals and objectives depends upon how well its information system is managed. This explains why UNESCO has for the past years been clamoring for the digitalization of Education Management Information Systems (EMIS). Digitalized EMIS are known for being a panacea to problems faced by educational institutions around the world nowadays; yet little or no attention is paid to it in Cameroon State Universities. The main objective of this study is therefore to explore impediments to digital EMIS in the said universities. It is a mixed study; involving questionnaire administration to 47 and interviews with 08 administrative agents randomly selected from four Cameroon State universities. While quantitative data were analyzed with the help of SPSS in a descriptive manner, qualitative data were analyzed via content analyses. The latter was done in the light of Von Bertalanffy's Systems Theory and Kurt Lewin's Theory of Change. Results reveal that inadequacies in the availability of digital devices, administrators' skills as well as their perception on digital EMIS greatly affect its digitalization process in Cameroon State universities. To this effect, recommendations have been made and if implemented, they will go a long way to create a veritable paradigm-shift in the said universities.

Keywords: *Education, Management, Information system, Digital age, and Paradigm-shift.*

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INTRODUCTION

Education Management Information Systems (EMIS) needs are being moved from the traditional to an ICT-driven culture. The shift from conventional to digital EMIS translates into effectiveness, efficiency, and above all, quality improvement and assurance. To UNESCO [1], one of the potentials that technology for education offers is efficient education management in terms of governance and administration. Digitalizing EMIS is therefore an asset; for it allows for the treatment of large quantities and many different sets of data within the shortest time possible and with accuracy. EMIS thus manages all of an institution's data in a single integrated application. Such data includes students' information, staff information**,** timetable**,** students' achievement, students' behaviour**,** administrative**,** financial, examination**,** library resources, security and safety records amongst others [2].

To Kornkaew [3], EMIS is a system of people, technology, models, methods, processes, procedures, rules and regulations that function together to provide education leaders, decision makers and managers at all levels with a comprehensive, integrated set of relevant, reliable, unambiguous, and timely data and information to support them in completion of their responsibilities. EMIS play an important role in developing appropriate plans, strategies and policies for improving the education system [4]. It provides quality and timely data, drives efficiency, supports evidence-based decision making, streamlines flow of information and eliminates duplication of effort. It also improves capacity for data collection, storage and analysis [5]. The digital age as used here has to do with the period during which ICTs are at the centre of most human activities.

Given the fact that Cameroon State universities are steadily experiencing an increase in their student population coupled with the will of some university authorities to modernize their information management systems by digitalizing them, one normally would expect such institutions to be Cameroon's success story in matters of quality information management. The reality however is that the way technologies of the 21st Century are used here in EMIS is less to be desired. According to RIA [6], the level of computer use in Cameroon schools is 33.4% and only 6.2% of them have more than one computer. Very few of the said institutions are connected to the internet; that is, 9.2% and 10.8% of them have websites (Idem). To Fonkeng and Tamajong [7], the computer still has a long way to go to be introduced at all levels of the educational system as an administrative tool.

Even though official statistics on the level at which EMIS are digitalized in Cameroon State universities do not exist, when one relates the current situation to the UNESCO ICT's standards designed in 2008 and 2011 and the Lao EMIS strategic plan for 2008-2010, he will realize that these universities still have a long way to go. The present study falls under *Information, and Communication Technology (ICT) in Education*, specifically *School and University Information Systems Management*. The main objective is to explore impediments to digital EMIS in Cameroon State universities.

On a specific note, we intend to:

Assess the adequacy of digital devices that support EMIS in Cameroon State universities;
Determine the adequacy of administrators' digital skills in Cameroon State universities;
Examine administrators' perception on digital EMIS in Cameroon State universities.

CONTEXT

Many educational institutions around the World use a modern technology-assisted management system called Education Management Information System (EMIS) rather than use many different systems. This is so because the mode of data management used either enhances or deters the processing, storage, retrieval and dissemination processes [8]. The Lao EMIS strategic plan of 2008-2010 is instructive on this. When we relate the said plan to EMIS in Cameroon State universities, the gap between the ideal and the reality is clear. Indeed, activities such as enrolment/inscription, amphitheatre allocation, timetable designing, students and instructors' attendance, class lists and rosters, learners' identification, test/examination invigilation, results' calculation, storage, and publication, certification, information dissemination, financial transactions, library and security operations amongst others are still very much carried on rudimentarily or by the application of traditional systems of information management [2].

The National Institute of University Digital Governance that was created several years back is yet to serve the purpose for which it was intended. The introduction of online registration still sees learners queuing up under extreme temperatures and stampeding to get themselves registered or validate their inscription. The purported tele-education initiative has discreetly moved to what we now call tele-evaluation which is yet to prove its worth. Library resources and learners' identity cards' purported digitalization exercises are reserved for a handful of central libraries and wealthier students respectively. The mobile money initiative on its part still warrants students to converge at open-air mobile telephone operators' stands to have their transactions made, just as it is done in classical banks.

Similarly, information diffusion panels which most of them are already defected can only serve those who are physically present on campus and video cameras installed in some parts of the campuses do not detect acts of indiscipline and vandalism in all classrooms or amphitheatres. The use of metal detectors for security and safety purposes gained steam when there were sporadic Boko Haram bomb attacks some years back. They have unceremoniously gone on slumber and may only reawaken when there will be another terrorist attack. The process of creating institutional addresses for both lecturers and students is very slow and still leaves the State university community with the usual problem of poor access to information. This state of affair has in effect led to a whole lot of ills; hence, paving the way to all forms of odds at various levels of the university system.

It has significantly played negatively on students as most of them have lost scholarship as well as job opportunities, both at home and abroad; not to talk of resorting to undue repetitions, simply because of systemic dysfunctions such as poor access to information, fraud, juxtaposed marks, or missing results and files. The university that supposes to serve as a safety net for most of these learners who are already *frustrated* because of the unemployment situation of the country is gradually losing its rightful place. The question therefore is that, why is it that with the ongoing digitalization of EMIS around the world, Cameroon State universities seem to be *marking time*?

It is rather unfortunate that this backdrop is being witnessed in Cameroon State universities even amid the COVID-19 pandemic and at a time when the International Community is embarking on attaining the Post 2015 Education Goals that are expected to be accomplished by 2030; with the digitalization of educational activities being the locomotive. The major problem that is posed in this masterpiece therefore is the inadequate/insufficient digitalization of EMIS in Cameroon State universities. This affirmation is drawn due to the fact that the famous ICT in education platform in the said institutions is not creating any significant impact on its EMIS.

Understanding EMIS

Information is needed and needs to be managed for educational and supporting processes. Such information can either be descriptive, diagnostic, predictive or prescriptive. To Hassan and Saxena [4], information and decision processes are linked to each other. To them, data after processing is transformed into information and information is the base for the decision making process. Management according to Tegegn [9] is *an effort made to coordinate the exertion of human and material input in order to achieve the set objectives (p.07).* To Northouse [10], the function of management is to make available order and consistency to an organization like, putting in place agenda, fixed timetable, allocate

resources, be responsible to put in place structure, institute rules and procedures, develop incentives, make creative solutions and take corrective action.

Tegegn [9] defines a system as a set of elements or components that work together in relationship for the overall good and objective (or vision) of the whole [11]. To Fomboh [12], Management Information System (MIS) refers to *systems that process and create new information by manipulating existing information and present information to whoever needs it* (p. 18-19). To him, management information systems are often designed to alert managers to the existence or potential existence of problems and opportunities; but it is the job of the manager to identify problem source and to explore the opportunities given that management information systems reports can rarely tell a manager why a problem has occurred or how to take advantage of the opportunity. Education management information system is thus MIS in an educational setup.

EMIS has several components. Even though there is yet to be unanimity on the exact number of components that an EMIS has, a functional and effective EMIS has three main components; namely: technology, people and processes [13]. To Wako [14] however, EMIS has seven components which are: data collection, data processing, data analysis, reporting, publication, dissemination and feedback. As any other system, EMIS components are interrelated and must all be functioning and should be followed in order to achieve the desired result(s). An inadequacy in any of the components automatically creates dysfunctions in the entire system.

METHODOLOGY AND THEORETICAL IMPLICATIONS

The present study is exploratory in nature. Informants were persons occupying administrative positions in their respective universities. They involve persons at the level of the central administration as well as those at the level of attached administrative set-ups. Data was collected through questionnaire administration to 47 and in-depth interviews with 08 randomly selected administrative agents from four Cameroon State universities. They include the universities of Buea, Douala, Yaounde I and Yaounde II. See table below:

N°	University	Number of informants
01	The University of Buea	08
02	The University of Douala	12
03	The University of Yaounde I	19
04	The University of Yaounde II	16
Total		**55**

Figure 01: Table illustrating the sample size.
Source: *Field data, 2021.*

From the table above, it can be realized that 08 informants came from the University of Buea, 12 from the University of Douala, 19 from the University of Yaounde 1 and 16 from the University of Yaounde II. While quantitative data were analyzed descriptively with the use of the Statistical Package for Social Sciences (SPSS), qualitative data were analyzed through *content analyses*. The latter was done in the light of Von Bertalanffy's Systems Theory and Kurt Lewin's Theory of Change. The Systems theory was developed in the 1950s and 1960s by Von Bertalanffy. It explains and predicts the behaviour of the entire organization which includes: people, structure, environment and technology. It looks at the system as a series of interrelated components that work together for a common purpose.

The theory of Change as propounded by Kurt Lewin in the 1990s is a methodology for planning, participation and evaluation that is usually applied in companies, philanthropy, non-profit activities, and government sectors to promote social change. It explains the process of change by outlining causal linkages in an initiative in the short-term, intermediate, and long-term outcomes. The links between outcomes are explained by statements of why one outcome is thought to be a prerequisite for another. The theory makes a distinction between desired and actual outcomes and indicates that change can begin at any level of an initiative. The Systems theory and the theory of Change are thus relevant for the present study given that EMIS is a system that has inputs, processes and outputs and is in a perpetual mutation (change).

RESULTS

When one looks at Cameroon's higher educational management systems today, he can realise that much still needs to be done as far as the digitalization of EMIS is concerned. That is to say the digitalization of management information systems in Cameroon State universities in particular has and is still proving to be very challenging or marred with a lot of drawbacks. Three main determining factors have been identified in this study. They include the availability of digital devices that support EMIS, administrators' digital skills and their perception on digital EMIS.

The availability of digital devices that support EMIS

Digital devices are equipment that support electronic activities. They play a vital role in the functioning of any entity where they are implicated. Without digital devices, we cannot even talk about the digitalization of EMIS in a university system. Nevertheless, what we are saying here is that the availability of the said devices, especially those that support EMIS is inadequate and not that they are not existing at all. This inadequacy is very conspicuous and is determined here in terms of the availability of computers, mobile phones, and internet connectivity.

Computers in EMIS

A computer is one of the vectors of technology in education. It is an electronic device that receives inputs in the form of data, treats, and stores it, and sends out output in the form of information [2]. Even though computers are usually classified according to their capacities and not according to their numbers, it is not however gain-saying asserting that their availability, especially in a certain quantity greatly matters when it comes to information management in an educational setting. The university administrative personnel mostly use three brands of computers; namely: desktop, laptop, and notebook computers.

While the first is in most cases provided by the university authorities, the users themselves provide the last two, as informants indicated. These brands of personal computers are used together as most of the work that is realized in desktop computers is also done on laptop and notebook computers, both in offices and homes. The use of the laptop computer is therefore an initiative that some university stakeholders do take to continue with work that could have been done at the job site while at home. This is very glaring with the administrative staff as they use them to write their reports and with the teaching staff as they used them to prepare lessons, do online teaching, treat students' tests and examination marks amongst other things. The question that is yet to be answered however is, how many of these persons are endowed with any of the above mentioned forms of computers?

In comparative terms however, university administrative staff and financial administrators are more endowed with computers than other categories of people in the educational community; with financial administrators taking a slide lead. The number of instructors that do computer-assisted instruction and the number of librarians that use computers to do their respective jobs are minimal. In the students' leader category, Presidents of students' unions use computers regularly for management purposes; keeping the number of students' leaders per computer at a very low rate. The unit that is almost forgotten as far as the use of computers is concerned is the campus security corp. When we visited the different security posts, we got to realize that there was no computer anywhere; even in the Head of Operations' offices. The number of persons per computer in the different strata is estimated to be astronomic. The inadequacy in access to computers is accounted for by several factors. While some informants lay the blame on their hierarchy for failing to provide them with and/or the lack of an expressed will towards the adoption of technological innovations by the powers that be, others simply put forward that the current situation is orchestrated by inadequate finances.

Mobile phones in EMIS

Field data is illustrative of the fact that the number of cell/mobile phones is encouraging. Almost everybody owns a handset. It should however be noted that access to service phones here remains a nightmare. The users themselves provide most of the cell/mobile phones and not all of them have options that the different users can operate to their satisfaction. One must however reiterate that the variation in capacity or options is largely in favour of the wealthier class of the users. Students from economically disadvantaged backgrounds, for example, do not have access to sophisticated phones; given that their prices are usually very high. As for the fixed phone, they are rarely seen even in some top administrative offices of Cameroon State universities. Even the ones that are present are very old and in some cases defected. Their lines are at times very slow and congested; making it difficult for authorities to make urgent administrative calls. Their low numerical value, coupled with their outdated nature and other inconveniences that go with the use of the fixed phone has made most of the potential users to resort to the use of their personal mobile phones to treat issues that are of interest to the entire educational community as most of our informants reported. This situation is very glaring in the security units where only one fixed phone each or even none can be found in the different operation centers. Here below is a table that illustrates sources of digital devices that support EMIS in Cameroon State universities.

Responses	**Self**	**Hierarchy**	**Others**	**Total**
Frequency	34	09	04	47
Percentage	72.34%	19.14%	8.51%	100%

Figure 02: Respondents' opinion on sources of digital devices that support EMIS
Source: *Field data, 2021.*

From the table above, it can be seen that the users themselves (72.34%) provide most of the digital devices used. Such gadgets include mobile phones, laptop computers, and even some desktop computers and printers. Hierarchy (19.14%) provides others and the rest are got from other sources (8.51%). Other sources here include donations from the State, people of goodwill, and organizations; be they local or international, governmental or non-governmental. These statistics reveal the less than expected level of attention that State university authorities in Cameroon are paying to technological innovations in EMIS. In brief, amongst all the staff rooms, students' union offices, and security units visited, none is endowed with even a single photocopier. Very few libraries and central administrative offices can boast of a photocopier. At the same time, we know that the quantity of documents that these different categories of persons grapple with is enormous.

Internet connectivity

There is no gain say in affirming that the internet/broadband penetration rate in Cameroon is much lower than voice telephony. Officially, by working to harness the potential of optical fiber, Cameroon is entering the broadband era, but things have not yet significantly changed for the daily user. According to RIA [6], internet use in Cameroon sits at only 1.3%. By the year 2012, Cameroon ranked last among RIA Survey countries in the use of mobile internet (at 9.8% penetration). Among the users, 69.4% of household users claimed to access the internet via mobile 3G and 4G services; but affordability remains a crucial issue as 49% of the population cannot afford it. Some Recto rates or Vice Chancelleries as the case may be, faculties, departments, and specialized services such as multimedia centers, libraries, and financial departments are endowed with internet connection. While it is accessed free of charge in some establishments, access to it is got through the payment of a token and the issuance of an access code to potential users.

Out of the five sampled Wi-Fi networks in the University of Yaounde I for example, three of them are access-free. The question that keeps looming however is whether these services are regular and of high speed or not. Mobile telephone companies in Cameroon are presently on a tussle for the first position for the provision of the different generations of internet service. Changes in generations suppose to mean changes in quality in terms of speed and regularity. From the look of things however, it is the *generations* or the nomenclatures that change and not the levels of internet speed. Being connected to the internet in universities is a difficult task to go by. Even when access is got, it is not always easy for the user to explore the information that he/she wants or needs; given that internet speed is always low. It fluctuates and at times descends to as low as *1.0 Megabits/s*. This situation makes users spend useful time waiting for their computing devices to execute the different operations that they commanded; just for most of them to be searched over several minutes and end up in a fiasco. This slowness in internet speed leads to boredom and even discourages many from using the said services; hence, a return to the traditional system.

When we visited the different units of some institutions, we got to realize that most of the internet keys that they were using were bought with money from their private pockets. Nevertheless, the said internet keys were used to run educational affairs of the institutions in question on daily bases. Moreover, in some units where these services are provided by the authorities, the users are usually asked to contribute and pay for it on different turns. The main problem is not even at the level of procurement; a serious issue is with its regularity, coverage, and speed. To this effect, the Director of the Francophone Virtual Campus at the University of Yaounde II, Soa says that they have the problem of internet access. To the President of the students' union for the Faculty of Law and Political Science of the same university, they do not have internet coverage, Wi-Fi coverage is more or less at the level of administrative offices.

The President of the students' union at the Faculty of Arts, Letters and Social Sciences of the University of Yaounde I on his part says that they have connection problems at times. Still in that light, the President of *Circle Philo-Psycho-Sio-Anthropo (CPPSA)* wails that one of the major problems is that the connection is slow and is not available all the times. This means that the presence of internet service in Cameroon State universities is a force to reckon with; given that when it is available, its sustainability and speed is always questionable. See informants' response below.

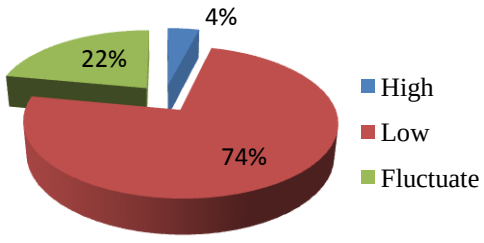

Figure 03: Informants' opinion on the level of internet speed on campuses of Cameroon State universities
Source: *Field data, 2021.*

The majority of the respondents are for the opinion that internet speed in the campuses of Cameroon State universities is low (74%) while a meagre number of them say that it is high (04%) and those who say that it fluctuates are also few (22%). Whatever the position of the respondents, they are unanimous on the fact that there is the absence of an internet broad band system; a situation that could have taken the internet speed very high and accessible to many.

Administrators' skills on digital EMIS

Skills or competences in technologies are acquired in two ways; that is, through formal training or *learning by doing* [2]. While the former is sanctioned with an end of course testimonial/attestation or certificate, the latter is got through familiarization, practice and experience. To Barry in Karsenti, Collin and Harper-Merrett [15], the number of teachers trained on the use of ICTs hardly goes above 25% and a good number of them are not yet equipped with skills to use the said tools. Up till date, most, if not all persons in charge of managing universities come from the teaching staff. An informant testifies that it was when he was in secondary school that he was familiarized with how to use Microsoft Word and Excel. He did the rest through his personal experiences. He continues by saying that very few of his collaborators master computing devices.

Another informant from the same institution declares that he learned how to use digital devices through *learning by doing*. In the same perspective, an informant lamented that given the fact that he did not acquire any ICT-based training, there are certain operations that he does not master so well. There are levels where he is blocked, he adds. Still in that light, another informant in another institution says that it is personal research that fortified his skills in ICTs.

Seminars are veritable forums where continuous training takes place. They usually involve people of a given domain and during such forums, awareness is created on the topic under discussion, and ground works are laid for the better implementation of its resolutions. Every institution that purports to be a model supposes to embark on the organization of periodic seminars; for learning is a continuous affaire. According to our informants, some seminars were organized in 2021 at the University of Yaounde I, specifically on *Google Classroom*, with the prevalence of the COVID-19 pandemic. So far, the lecturers that were concerned are said to have been doing just what is expected of them even though they complain of several challenges that go with the exercise.

Furthermore, ever since the teaching of ICTs was introduced into some public university systems, it has all along been limited to the Masters cycle. That is to say, it is taught only in Masters I and II; since the Masters program takes two years of class work. At these levels, students are drilled on the basics about ICTs, especially as used in the educational field. That is to say, this technology is taught with emphasis on how it can be used to facilitate the diffusion and the acquisition of knowledge. Specifically, it is looked upon as a research instrument and medium and as a catalyst/vector of change. It is not news to state that most of the students that gain admission into Cameroon State universities do end at the level of the Bachelors Degree.

Only a hand full of them does decide to further their education by applying for the Masters and the Doctoral programs subsequently. This means that they usually leave without being enlighten on the elements of ICTs; what a catastrophe? Imagine the number of young Cameroonians that graduate with Bachelor's Degrees every year without even basic knowledge on this technological innovation but who are forced to use it on daily basis in their various areas of service. Most of them have made it a duty of going to professional schools and/or skills centres to do ICTs immediately after their first degree programs to upgrade their know-how and be more competitive in the job market; training that could have been delivered to them in their respective universities.

Moreover, the way the teaching of ICTs is done at the Masters cycle does not give one hope for the future. This is because there are virtually no provisions made for the organisation of practical lessens that can allow students to have a direct touch of the technology themselves. This concentration on the theoretical part of it has made most, if not all of these students to graduate as *paper tigers* in ICTs and not as citizens who are capable of taking their destiny into their own hands. In effect, they still need ICTs related training even after their respective Masters programs; since no provisions are also made for those furthering their studies to the Doctorate cycle to continue acquainting themselves with this technology. With the present dispositions in the teaching of ICTs in Cameroon State universities, status quo can only be maintained as most of those that are usually called upon to either deliver courses or run our State universities are persons with Masters Degrees. See informants' opinions below.

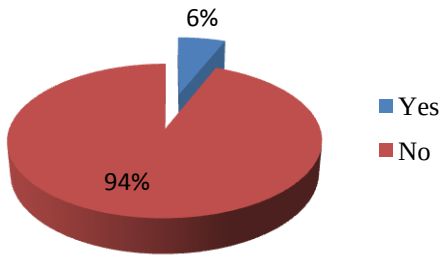

Figure 04: Respondents' opinion on training in digital EMIS
Source: *Field data, 2021*

A considerable majority of people in Cameroon State universities confirmed that they did not undertake any former training course(s) on digital EMIS. They constitute 94% of the respondents while those that are trained in the domain constitute 06% of the people; even though their expertise in the domain is at times questionable. The above situation is said to be one of the main reasons that account for the current stalemate.

Administrators' perception on digital EMIS

Different people do perceive the things they live or experience differently. It is however possible to find a group of people that have the same World view or vision on certain occurrences. This depends on several parameters, amongst which is the nature of the environment where they live, their life experiences, and above all, their culture or way of life. The way an individual or group of people perceives an innovation thus has a significant impact on its adoption rate or level [16]. Generally, when an innovation is introduced, it elicits fear in potential users [17]; *fear of the unknown* as one of our informants called it. He says that when technology is introduced in an activity, it makes people to be afraid. This mindset has made even those who have managed to embrace it to dangle between digital as well as traditional ways when executing their respective tasks. The table below is illustrative of the prevailing situation.

Responses	**Digital tools**	**Traditional tools**	**Both tools**	**Total**
Frequency	03	15	29	47
Percentage	6.38%	31.91%	61.70%	100%

Figure 05: Respondents' opinion on management information systems tools
Source: *Field data, 2021.*

Most of the respondents (61.70%) use both digital and traditional tools to manage education information systems. A good number of them (31.91%) still use only traditional tools while 6.38% of them use digital tools. To Rogers [16] however, this type of situation plays negatively on the adoption of an innovation. On the contrary, if the perception is the other way round, then the reverse will also be true; that is, there will be an adequate and timely adoption of the said innovation. We have earlier sided with Rogers [16] by saying that the more an innovation can resolve the basic problems that people face in their day-to-day life, the earlier it will be adopted. In other words, people do attach importance to things that can help them in one way or the other. The debate on the place of technologies in the life of users and potential users is an old one and compromise has already been reached on the fact that this technological device of recent times is paramount in everyone's life and activities. The importance that is attached to technologies within the university system in Cameroon varies from one institution to the other and at different levels within the educational community.

While some educational institutions are attaching importance on the adoption of technologies and are making considerable efforts to integrate and effectively use it in their information management systems, others are yet to see why they should consider such a technology important and worth adopting. The situation is very telling in the field as only a meagre number of the universities are making a relatively forward match. Indeed, among the institutions visited, the University of Yaounde I stand tall for now as an institution that has embraced technologies to a certain extent. When we tried to know why, we were made to understand that it is thanks to the personal efforts of the Rector who wants to modernize the said institution at all levels.

The other universities visited are either maintaining *status quo* or even taking a backward move. Some informants linked the problem to the cost of technological devices and/or the rents that are paid for the services provided by the technology-related service providers amongst other drawbacks. The digitalization race is a very complex and delicate one, but one will not be wrong to reiterate that when there is the will there is always a way. Indeed, the University of Yaounde I that we are throwing flowers at also has its flaws in matters of digital EMIS, but one must be objective enough

to *call a spoon a spoon and a spade a spade*. Talking about variations at different levels within the same institution, there are certain areas or services where the digitalization process is more rapid than in others.

DISCUSSION OF FINDINGS

The digitalization of information systems is an incontestable reality in educational establishments around the world. This explains why debates that center on this subject matter are rift within the past decades. According to World Bank [18], countries in the world are in need of an effective EMIS. To Bikas [19], information science is increasingly becoming an indispensable aid to educational operations and to Yu [20], people's conception of what computers can do, and what they can be trusted to do, are evolving. Computing is thus changing the scope and nature of information systems and redrawing its map. The size and complexity of educational institutions today therefore call for rapid and efficient methods of planning, communication and analysis of their management functions that can help manage their staff, students, financial resources, facilities and the environment at large [19]. Bikas further declares that,

Computers help to analyse the interdependence of the different components of the university system and to rationalize decision making and resource management by way of better communication, feedback and control. Technological developments, especially in hardware development due to miniaturization, and new architectures coupled with accelerating development of ever improving software packages have facilitated the use of computers and, thereby, of an enormous amount of varied but useful information for university management [19].

He however asserts that the computerization of university management systems have been going on in varied turns for the past decades; moving from one stage to the other and up till now, some universities are still at the initial stage. Such is the case with some Cameroon State universities. RIA [6] corroborates this assertion by indicating that 33.4% and 7.7% of individuals in educational establishments and libraries respectively use computers in Cameroon. The present situation warrants the reconfiguration of mechanisms that can help arrest the current stalemate. To this effect, Yu [20] declares that as barriers to connectivity are being removed, products and processes are being redefined; quality criteria are shifting and new social structures are emerging around systems both in the user's world and in the developer's world.

This paradigm-shift is however marred by the absence of qualified manpower [21]. According to Carrizo and al. [22], it is difficult to have qualified personnel for work that requires EMIS. The training of personnel is therefore required during the development of EMIS. As university heads are involved in administrative duties in their respective offices, it is incumbent for them to be drilled on computer skills, trained on the updating and maintenance of files and records electronically and entrusted with attributes that can enable them perform their roles effectively and efficiently. Such training and attributes will go a long way to empower users such that their perception on digital EMIS will never be the same again.

However, as any system that is in perpetual mutation, EMIS' inputs need to be continuously controlled for the desired and actual outcomes to be obtained. The absence of some of the components be they digital devices, administrators' training and/or perception on digital EMIS automatically creates disequilibrium in the whole system, which in turn thwarts on the change process. Given that change can start at any stage of an activity, the putting in place of appropriate mechanisms to arrest lapses witnessed in the process of digitalizing EMIS in Cameroon State universities can never be considered as a late initiative.

CONCLUSION AND RECOMMENDATIONS

This sub-section draws curtains on the present write-up and sets the pace for the mitigation of impediments that contribute in retarding the digitalization of EMIS in Cameroon State universities.

CONCLUSION

The digitalization of educational activities is not more a matter of choice. The caravan is on the move and the earlier each and everyone prepares himself towards joining the success convoy, the better. Indeed, things are now done in a way that if one is not ICT-literate, he has himself and no other person(s) to blame. Therefore, given the place that new information and communication technologies occupy in EMIS and the necessity for an enabling atmosphere to be created towards their adoption, some measures have been proposed that if effectively implemented, will go a long way to bring remarkable changes in the entire system.

Recommendations

Given the potentials that technologies have and the challenges that abound concerning the digitalization of education management information systems, it is incumbent deriving more adaptive mechanisms that can be put in place to spur the exercise.

The organization of a National Forum on Technology in Education and the definition of a policy on digital EMIS

Cameroon, Comoros, Congo, Guinea, Lesotho, and Madagascar fall under Sub-Saharan countries with no policy or plan on digital EMIS [6]. Even though annual National Technological Days have been observed in Cameroon, the issue of digital EMIS has not been adequately addressed during any of the sessions. This justifies why the holding of a Grand National Forum on Technology in Education is imperative in Cameroon today. Such a forum should involve stakeholders from all ministerial departments that are concern with education in Cameroon. Experts from African countries such as Kenya, Ivory Coast, Ruanda, and Senegal where technology in EMIS rates are relatively high should be invited to share best practices with the Cameroon educational community. In addition, it should be noted that education is not only an affair of those that are directly involved; it is an affair of the educational community as a whole. So, the educational community including the civil society, Non-governmental Organizations, and other bodies relating thereto need to be part and parcel of such a National discussion panel to chip in their modest contributions in terms of ideas on the path that the use of technology in the educational arena in general and the digitalization of EMIS in particular suppose to take.

Since there is no national policy based on the adoption of digital EMIS in Cameroon for now, the various points of view sampled from participants during this seating should be drafted in a strategic document that spells out in clear terms how the digitalization exercise will take place. The document should be published in the official gazettes in both English and French for the reading and understanding of the entire Cameroonian educational community. This suggestion is in line with the plea of one of our informants who said that there is a need for a national policy on digital EMIS. The application of this suggestion in effect allows for the harmonization of the whole process and will go a long way to solve the EMIS digitalization disparity problem that prevails even within the same units in Cameroon State universities.

The installation of broadband internet service and the diversification of energy sources

According to Nzépa and Keutchankeu [23], internet use in Cameroon sits at only 1.3%. Authorities of Cameroon State universities are yet to solve the problem of inadequate access to internet service in their various institutions. Wi-Fi service in the said institutions is estimated to cover less than 10% of the different campuses [2]. Even though some of the institutions have advanced in terms of Wi-Fi coverage as it is the case with the Universities of Buea and Yaounde I, the general trend is that considerable parts of the campuses are yet to boast of regular and broadband internet service.

The accomplishment of this recommendation is possible through two major ways: the installation of broadband internet service on the one hand and the autonomization of Wi-Fi in the various sectors of activity. Broadband internet service is very necessary; for, there are areas that carry on complex activities and those that are involve a huge number of users such as computer or multimedia centers, virtual learning centers/environments, and digitalized libraries. As for Wi-Fi service, every sector will need to have autonomy and the way such a service is exploited should be regulated. This can be by way of rationalization in cases when it is thought that there could be congestion. However, rationalization here should not be too stringent in a way that users will instead be deprived of services that they wanted to benefit from as it is the case in a central library of one of the universities visited.

As far as energy supply is concerned, some examples of alternative energy sources that are present on some campuses is already a good step ahead, but they need to be diversified and made available in sectors where they are much needed. Even though the best is yet to come as far as the multiplication and effective use of alternative energy resources is concerned, other institutions that are still feet-dragging should feel free and bold enough to copy better examples already being portrayed. We are referring here to the back-up system that is already present though only in a unit of one of the institutions visited. Apart from solar and wind energy, other renewable energy sources could be explored and integrated. While searching for such energy sources, however, automatic standby generators should be installed to ensure continuous electricity supply in the meant time.

The training of experts on digital EMIS and the subsidization of already existing training programs

This suggestion should not be pursued at the expense of scientific and geographic diversity. Rather, we encourage the establishment of small, focused training-program grants for educational stakeholders in Cameroon that have groups of highly productive institutions in important specialized technology-related fields; but might not have the number of departments needed for more traditional, broad-based training grants. Our endorsement of training grants and studentship is not intended to result in the training of more certificate holders, which we argue would be entirely inappropriate; rather, any growth in the numbers of trainees supported through an expansion of training grants should come at the expense of the numbers of trainees supported on research grants. Thus, the implementation of this suggestion should not only produce an increase in the number of learners but also a change in the mechanism by which their training is supported with State funds.

The demystification of ICTs to users and potential user communities

The need for the demystification of ICTs is still a force to reckon with in most users in Cameroon State universities. The young just like the old see any technological innovation introduced or proposed to them as being difficult to grapple

with. This makes them to be reticent as far as its effective use is concern and hence, leading to a lot of systemic lapses. From our investigations, it was realized that ignorance and/or poor access to information relating thereto are largely to be blamed. There is therefore the need for sensitization seminars to be regularly organized on the integration and effective use of technological innovations in education in Cameroon.

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Conflict of interest

The author hereby declares no conflicts of interest regarding the publication of this paper.