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**CLOUD COMPUTING CENTRES AND THE EFFICIENT
MANAGEMENT OF HIGHER EDUCATION**

A Comparative Analysis of Cameroon and Finland

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ABSTRACT

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<p>The thesis was written about efficient management in Finland as compared to Cameroon and about the extent to which cloud computing systems can enhance this efficiency. The aim of the thesis therefore is to compare the resulting impact of cloud computing centres on the level of efficiency of the management of higher education resources in Finland and in Cameroon.</p> <p>The research for this thesis was carried out by the help of books, journals, e-books, websites and online material. The report has strictly been written using secondary sources of data. In using secondary data sources, information gotten for the thesis was developed through qualitative research. The research design was done using the case study model. The Centria University of Applied Sciences in Finland and the University of Bamenda in Cameroon are highlighted as the main case studies. In this vein, a SWOT analysis was done for each of the case organisations and the research findings, conclusion and recommendations made about possibilities of enhancing management efficiency using cloud computing systems.</p> <p>From this research, it was found that the use of cloud computing systems is growing in Finland just like in Cameroon, however, the level of efficiency of management of higher education resources in Finland has been found to be relatively higher than in Cameroon.</p>		
Key words Cloud, Efficient Management.		

CONCEPT DEFINITIONS

Cloud: Hurwitz (2009, 9), explains that the cloud itself is a set of hardware, networks, storage, services, and interfaces that enable the delivery of computing as a service. Cloud services include the delivery of software, infrastructure, and storage over the Internet (either as separate components or a complete platform) based on user demand.

Efficient Management: Efficient management (performance efficiency in management), refers to a measure of output relative to input in terms of financial gain (input cost savings; say) or value to the organization or unit being managed. Examples of performance efficiency measures include: cost of labour, equipment utilization, facilities maintenance, and returns on capital investment. (Schermerhorn 2011, 11.)

HPC: High Performance Computing

ICTs: Information and Communication Technologies

MOOCs: Massive Open Online Courses

ABSTRACT
CONCEPT DEFINITIONS
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1 INTRODUCTION

One of the main pressures on education managers and on managers in general throughout the world, is to improve the efficiency of the organisational system in which they work. Cloud computing is receiving keen interest and is being widely adopted in organisations today in the most parts because of its potential to enhance this performance efficiency of management. However, as it stands, there is not much information about how Cloud Computing Centres in our universities are managed not to mention how they can contribute to efficient management in most institutions of learning especially in low income economies like Cameroon. The study will help us to learn more about conducting this type of research because it is hoped that in the course of the research process, more lessons would be drawn about how various institutions of higher learning are coping with their problem(s) of mismanaged resources. Given the tight time schedule of the semesters, less time will be available to meet up with the ideal expected time required to carry on such a research study. Thus, by sacrificing just a few hours a week, it is clear that one cannot pretend to have full access to enough data that can be fully representative of the actual status quo on a daily basis.

Presumably, costs can be lowered either by reducing the level of inputs (fewer teachers, classrooms, textbooks) or by selecting a delivery technology that has a lower cost (e.g., use of programmed instructional materials instead of radio and the use of radio instead of teachers). However, in some countries, serious limitations exist on the availability and quality of inputs and on the range of practical and affordable technologies. In its simplest terms, efficiency in educational management means achieving the desired goals of education at lower costs or achieving more of those goals without increasing costs. But, it is not that simple. Indeed, since the introduction and management of Cloud Computing Centres (CCCs) in most countries across the globe, it is believed that the use of CCCs in high income countries like Finland is making management more efficient than in low income countries and the extent of (and what accounts for) this variance in the efficiency of the management performance of the institutions in these countries remains a cause for concern.

The aim of this thesis therefore is to study the possible impact of the introduction of CCCs and account for the possible variance in the level of efficiency of the management of higher education resources in Cameroon and in Finland.

To better understand the problem(s), it would be necessary to ask the following questions:

1. What is the management style of higher education resources?
2. What is the level of efficiency of the management of higher education resources under study?
3. Is there a variance in the level of efficiency of the management of higher e-resources?
4. Why the existence of the problem of Performance inefficiency in the management of higher education resources.

Given that the thesis requires a comparison of the performance of the management of resources in an educational establishment, it is logical to consider only educational establishments that have similar management policies and practices. This thesis shall therefore examine the performance of the management of resources of two universities that have similar management policies and practices, one in Cameroon and the other one in Finland.

In Cameroon, the study shall be conducted in the University of Bamenda (UBa). We shall limit our thesis to the University of Bamenda. In Finland, the study shall be carried out in Centria University of Applied Sciences. This thesis is therefore highly justifiable, and it is hoped that through case study methodology, more light would be shed on the aforementioned problems. This in turn may be a source of motivation to many other researchers whose aim it is to seek solutions to similar problems.

To realize its aim, the study shall proceed as follows:

1. Relevant data and information shall be obtained about the management of each of the universities under study, using secondary data sources.
2. Finally, a research report that combines the understanding of relevant theory and findings from the results of the qualitative research shall be written.

2 BACKGROUND OF EFFICIENT MANAGEMENT

This chapter consists of four sections. In its first section, the meaning, theory and ways of pursuing efficiency in the management performance of organisations and the idea of using CCCs are explored. In the second section, elements of the use of cloud computing in public administration are examined. The benefits of CCCs in seeking to achieve performance efficiency in management are then discussed in the third section of the chapter. The chapter rounds off with the problems that can be experienced in running CCCs as a means to efficient management in its last section.

2.1 Pursuing Efficiency of Management of an Organisation

One of the objectives of this research is to determine the level of efficiency of the management of higher education resources in Finland as well as in Cameroon. The performance efficiency of the management of an organisation such as a university system can be enhanced in various possible ways. The bone of contention here is that CCCs are facilities that the university authorities can make use of in order to increase chances of raising the performance efficiency results of the management of any organisation such as a university system be it in Finland or in Cameroon. Generally, the performance of any manager can be measured at least using two criteria namely: efficiency of management performance and effectiveness of management performance. To promote high effectiveness and efficiency in management performance in organisations calls for Corporate Governance – Good Corporate Governance. To pursue high efficiency in management performance, the top level management of an organisation should indirectly ensure good corporate governance. (Cole & Kelly 2011, 134.)

2.1.1 Meaning and Levels of Efficiency of Management

To fully appreciate the meaning of the efficiency of management of any organisation, it is imperative to review the meaning of management and its related terms. In the first place, management refers to a social, practical, dynamic and decision-making process that entails: the pursuit of the goals of an organisation through the efficient and effective planning, organising, and controlling of the resources of the business including gaining the commitment of her personnel towards the achievement of organisational objectives as well as the objectives of its personnel and of other stakeholders. Planning entailing a sub-

process of making decisions about the ends (objectives) and about the best means (plan) to achieve the ends of a given entity. Organizing referring to the sub-process of making decisions: about what constitutes the entire work load of an entity, about how best to divide work into work parts, how best to allocate resources to each work part and about what effective coordination mechanism to use so as to integrate the various work parts and resources towards set objectives of the entity. Leading referring a dynamic sub-process of making decisions about how best to influence human resources to outperform voluntarily. Controlling referring to the sub-process of reviewing organizational objectives and making decisions about the best performance standards and methods for measuring performance of resources, how to measure actual performance and how to take corrective action(s). (Kinicki 2016, 3.)

According Cole & Kelly (2011, 13), management can alternatively be considered a series of roles played by every manager in an organisation. Mintzberg worked with a sample of five executive officers and realized that these managers spent more of their time playing the following roles. He actually classified these roles into three major categories namely: Interpersonal roles, Informational roles and Decisional roles. Interpersonal Roles referring to managerial activities that require the manager to interact with stakeholders in and out of the organization so as to gain sustainable and mutual beneficial exchanges with them. These roles include; figurehead, liaison and leader roles. Informational Roles referring to managerial activities in which relevant information is gathered and communicated to appropriate stakeholders as the case may be. These roles include: monitor, disseminator and spokesperson roles. Decisional Roles referring to activities that require managers to make use of relevant information in order to make well informed decisions in the face of challenges, conflicts, etc. These roles include: disturbance handler, resources allocated, entrepreneur, negotiator roles.

By deductive reasoning, the management of higher education resources (such as its teaching and administrative staff, financial resources and material resources such as its CCC) refers to a social, dynamic, practical and decision-making process of pursuing goals of higher education by efficiently and effectively planning, organising, and controlling the resources for higher education, including gaining the commitment of its personnel towards the achievement of CCC objectives as well as those of its personnel.

Another term that relates to management as used in this research that needs a clarification of its meaning is corporate governance. According to Clarke & Clegg (1998, 299), leading management writer Bob Tricker editor of *Corporate Governance an International Review*, offers a full definition of Corporate Governance thus: It is concerned with processes by which corporate entities, particularly limited liability

companies, are governed; that is with the exercise of power over the management of the enterprise, the supervision of executive actions, the acceptance of the duty to be accountable and the regulation of the corporation within the jurisdiction of the states in which they operate. Clarke & Clegg go further to highlight that the OECD offers the most direct definition of Governance in a Corporation. Corporate Governance refers to the discipline and control of firms designed to ensure that they are efficiently managed and that the economic welfare of society is maximised. The existence of Good Management Practices in an organisation can therefore be an indication of the existence of Good Governance in that entity. (Cole & Kelly 2011, 135.)

The key stakeholders of every enterprise especially its Board of Directors can in effect guarantee good management practices by promoting Good Governance in the enterprise. The existence of Good Governance can be checked using at least the following indicators, otherwise known as characteristics of good governance. (Wiyghan 2011, 80.)

Being effective in management performance and ensuring that the management structures, systems and processes of the entity produce results that meet the goals or needs of the relevant stakeholders; e.g. products must be satisfactory to the target customers. Also, being efficient in management performance making sure that resources (manpower, materials, money, time, etc) of the firm are used judiciously with little or no wastes; i.e. input resources especially natural resources should be used sustainably. (Cole & Kelly 2011, 18.)

Secondly, ensuring that management activities are participatory and consensus-oriented that is, to be participatory or democratic in your management actions, seeing into it that democratic values such as freedom of association and expression by all employees directly or indirectly (via their representative organisations such as staff associations and/or trade unions) should be upheld at all levels of organisational life. For management practices to be consensus-oriented, requires that the common interests of all stakeholders should always prevail over and above individual or sectional interests. (Wiyghan 2011, 81.)

Furthermore, management should be transparent in managerial decision making and ensuring that information about decision making and how the decisions are made and enforced should be freely available. It should also be directly accessible to relevant stakeholders when and wherever necessary. Management should also be accountable to relevant stakeholders of the organisation, making sure that those who will be affected by the decisions and actions of the firm, are well informed about the performance and progress of the firm when and wherever necessary; (Wiyghan 2011, 82.)

Lastly, being socially and morally responsible in management practice, ensuring that the social and ethical standards of the business environment are respected at all levels. A morally responsible activity can be to fight against corruption or any other ills that may be thriving in the organisation and upholding the rule of law in management practice but being impartial in enforcing laws applicable in every instance of organisational life, ensuring the full protection of human rights especially of minorities in the firm; Formulating and implement a policy of Corporate Criminal Responsibility in the firm. (Wiyghan 2011, 83.)

With a clear understanding of what management and corporate governance is all about, we can now review the meaning of efficiency in management and the possible levels of efficiency in management. In one of his books titled “Exploring Management”, leading management writer and researcher, Professor Schermerhorn gives a definition of the notion of efficient management that is most suitable for this research. To him, efficient management or performance efficiency in management of an organisation refers to a measure of the output relative to input of that organisation in terms of financial gain (input cost savings; say) or in terms economic value to the organization or to the unit being managed. (Schermerhorn 2011, 31.)

To get this definition of efficiency much clearer, other management researchers assert that efficiency should not be confused with lower costs only. To them, it is a mistake to believe that a lower-cost activity is necessarily more efficient. In other words, it is a mistake to believe that just lowering the cost of education improves efficiency without considering the quality of the activity. Sometimes lower cost leads to higher efficiency, but not always. Where there are excessive expenditures and waste, greater efficiency and lower costs can happen at the same time. However, where more costly inputs lead to proportionately greater productivity, efficiency may involve higher costs. The key point is that the efficiency of an activity can only be determined by considering the quality of the output, not just the cost of the input. Inputs are the resources used in the production of the education experience, e.g., teachers, textbooks, other instructional materials, school facilities. (Cole & Kelly 2011, 17.)

Hence, it is just but logical to define the performance of management in the light of Prof. Schermerhorn, as a measure of the degree of success or failure of management in the quest for productivity – Output (in terms of quantity and quality of products) for given inputs (in terms of machinery, materials, money and manpower used in the CCC). Professor Schermerhorn further distinguishes two forms of management performance measures: performance effectiveness and performance efficiency. Performance efficiency on the other hand, refers to a measure of output relative to input in terms of financial gain (input cost savings; say) or value to the organization or unit being managed. (Schermerhorn 2011, 32.)

TABLE 1. Levels of Efficiency in Management Performance (Adapted from Human Development Report 2017, 61.)

Level	Key Characteristics	Level of Efficiency in Management Performance	Scale (0 %- 100%)
3	Low Wastes of Resources and high-quality outcomes.	High Efficiency	70% - 99%
2	Moderate Wastes of Resources and somewhat high-quality outcomes.	Moderate Efficiency	50% - 69%
1	High Wastes of Resources and moderate quality outcomes.	Insignificant Efficiency	0% - 49%

There can be more than three levels of management efficiency. However, the table (TABLE 1) above describes just three possible alternative levels of efficiency of management performance in an organisation that can result from the use of cloud computing systems.

Level 1 refers to the lowest level of efficiency in management performance of an organisation. This level is often characterized by high levels or the existence of wastes of financial, material and/or human resources of the organisation. On a scale of 100, this level is rated at by between seventy percent and ninety nine percent.

Level 2 refers to the moderate level of efficiency in management performance of an organisation. This level is often characterized by average levels or the existence of normal levels of wastes of financial, material and/or human resources of the organisation. On a scale of 100, this level is rated at by between seventy percent and ninety nine percent.

Level 3 refers to the highest level of efficiency in management performance of an organisation. This level is often characterized by low levels or the absence of wastes of financial, material and/or human resources of the organisation. On a scale of 100, this level is rated at by between seventy percent and ninety nine percent.

2.1.2 Possibilities of using CCCs to pursue Efficiency of Management

This research also seeks to ascertain how CCCs can enhance management efficiency in an organisation. To appreciate how CCCs can possibly be used to enhance efficiency of management of an organisation, the meaning of cloud computing is first clarified.

The term cloud computing originated as a twist on "computing cloud," an easy-to-visualize way to portray a group of computers or the Internet itself. Put simply, cloud computing allows users, wherever they are in the world- to obtain computing capabilities through the Internet from a remote network of servers. All that is required is a broadband Internet connection, at the other end of which are computing clouds-supersized data centers containing tens of thousands of servers hosting Web applications. The Chartered Institute for IT states that Cloud computing is best described as 'a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction'. Driven by advances in cloud technology, the proliferation of mobile devices such as smart phones and tablets and use of a variety of applications supported by abundant broadband Internet access, the computing landscape is - continuing to change. Users can use cloud services when and where they need them and in the quantity that they need and pay for only the resources they use. It also offers huge computing power, on-demand scalability, and utility-like availability at low cost. (Hurwitz et al 2009, 8.)

Hurwitz et al (2009, 9), further explains that the cloud itself is a set of hardware, networks, storage, services, and interfaces that enable the delivery of computing as a service. Cloud services include the delivery of software, infrastructure, and storage over the Internet (either as separate components or a complete platform) based on user demand. The most common of these cloud computing services have been found to be cloud storage services.

According to leading ICT researchers, cloud storage is the lowest layer of cloud computing system and most reveal that Amazon's Dropbox, Google's Google Drive, and Apple's icloud are in wide use especially in high income economies like Finland. Dropbox products' device is under the Amazon storage device, easy to operate, with high service reliability and fast transmission speed. These advantages make Dropbox company gain more users. Dropbox's user covered business executives, retired people and students. Google Drive has become Chrome OS theory 37 "local drive." Google Drive is provides users with 5GB of free storage. Paid packages are 25GB, 100GB and 1TB and several other, to meet customer

demand for large-capacity storage space. In addition, Google Drive's integrated applications included free apps and fee-based apps, charging fees for users of paid apps and divided profits to developers. iCloud is the service for the use of Apple's cloud equipment launched in Apple's June 7, 2011. Users can get 5GB of free space. The iCloud platform can also store personal data to Apple's servers and automatically push them to each Apple device for the user over a wireless network, including iPhone, iPod, Touch, iPad, Apple TV, and Mac. (Yan 2017, 41.)

According to Cole and Kelly (2011, 17) efficient managers seek to solve problems and reduce costs. Hence pursuing performance efficiency in resource utilisation should in part be the ideal purpose of management. The contention here is that CCCs can create the enabling environment necessary to attain such an end. In this light there is evidence that authorities of the universities in Cameroon just like in Finland equally have training workshops in which they are schooled on better options of management including possibilities of using participatory management to enhance the productivity of the university communities. From the foregone discussion on how CCCs can be used to improve the Performance Efficiency of management, these researchers also seek to know how far these claims are true in the university communities understudy in Cameroon and in Finland.

2.2 Cloud Computing and the Management of the Public Sector of an Economy

The notion of network-based computing dates to the 1960s, but many believe the first use of “cloud computing” in its modern context occurred on August 9, 2006, when then Google CEO Eric Schmidt introduced the term to an industry conference. Cloud computing still doesn't appear in the Oxford English Dictionary. But its use is spreading rapidly because it captures a historic shift in the IT industry as more computer memory, processing power, and apps are hosted in remote data centers, or the “cloud.” (Regalado 2011, 1.)

According to Hurwitz et al (2009, 8), cloud computing is the next stage in the evolution of the Internet. The cloud in cloud computing provides the means through which everything from computing power to computing infrastructure, applications, business processes to personal collaboration can be delivered to you as a service wherever and whenever you need. Ylätopa (2011, 5), in his Bachelor's thesis on Cloud computing in the public administration of Finland asserts that in public administration, there is a need to adopt new technology that can save money, especially in this economic situation that we are in at the moment, where most of the financing of the public sector in the western countries, especially the social

services, are in crisis. Some of the developed countries see cloud computing as a partial solution to their problems.

Ylätopa (2011, 15) writes further confirming that the United Kingdom (UK), the United States of America (USA) and Japan are good examples because their cloud computing actions and plans are different mostly because they are developed economies and there is lots of information about their cloud computing. Ylätopa (2011, 16) proceeds and cites Globe Newswire (2009) as revealing that in the USA, the government's IT budget is 75 billion dollars (approximately 52 billion euros). The whole government's official web portal, usa.gov, has been moved to a cloud, called Enterprise Cloud, which is produced by a company named Terremark. usa.gov is managed by U.S. General Services Administration's (GSA) Office of Citizen Services and Communications and the portal is an easy-to-search, free-access site for finding information, on USA local, state and federal government agency websites in a centralized manner.

2.3 Benefits of Cloud Computing in Efficient Management of Educational Resources

Efficient management of higher education resources as discussed in the preceding sections, is related to better utilization of the available human and physical resources of higher education. This is happening surely because the organisations have been benefitting from the use of cloud computing. In the following paragraphs, the ways in which cloud computing can help enhance efficient management are explored.

Around the world, interests in cloud computing is growing rapidly, as executives in more and more industries identify ways to capitalize on the benefits it promises. Many organizations are now using cloud services and technology to develop innovative products, improve operations, share information with customers, partners and suppliers, and run important enterprise applications. Despite security concerns and other challenges, executives in virtually all sectors believe cloud computing can provide their companies with lasting competitive advantage (Marinescu 2013, 6.)

In a cloud infrastructure, most of the computer hardware is handled by the cloud providers. Therefore, cloud users do not need to invest a large amount of money on purchasing and maintenance of such equipment and they can pay for the usage of the cloud infrastructure. Thus, cloud computing leads to decrease the hardware cost and the infrastructure maintenance cost significantly. Moreover, fewer computer hardware save computing power and promote green IT in administration. Shrinking budgets, aging

facilities and rising costs present sizable challenges, so it is no surprise that many people are looking to use cloud technology as part of the solution (Marinescu 2013, 6.) Deploying applications that run the business side of higher education financials, enrollment and housing, for example is an obvious application of cloud technology. Like many other businesses, colleges and universities have limited funds to deploy and maintain enterprise information technology systems, so they turn to cloud for lower costs and improved efficiency (Marinescu 2013, 7.)

In the framework on improving student productivity, conferencing and collaboration in the past 20 years, has witnessed significant innovation in terms of how educators blend online and in-person classroom experiences to engage students. The virtual classroom allows students to watch lectures online, but the tools are also being used to augment traditional classrooms with shared cloud storage and social media. The flipped classroom encourages students to learn material on their own, saving class time for discussion and problem solving. Virtual field trips bring a world of experiences to the comfort of a dorm room. All these innovations are just the beginning.

The Massive Open Online Courses (MOOCs), are cloud-based educational platforms that have taken the world by storm. The impact of MOOCs is up for debate, but we are learning about the characteristics and behavior of students enrolled in these courses. Nevertheless, MOOCs are having an impact on classroom education as well as education policies at the state and federal level. During their relatively short history, MOOCs have been the subject of heated debate, but I think this is healthy because MOOCs are a disruptive force with the potential to positively impact public policy. The Bill & Melinda Gates Foundation is funding research to explore the potential of MOOCs. EdX, an open-source platform governed by Harvard and MIT, is trying to transform education the way Linux transformed the computing world. MOOCs are not likely to replace brick and mortar universities soon, but they will influence how we think about education. (Marinescu 2013, 36.)

A leading IT researcher Kundra states that duplicative systems in existing infrastructure in higher education lead to fragmented demand for the IT infrastructure resources and complex IT system environment. Nevertheless, Chandrasekaran & Kapoor (2011, 3) argue that Cloud Computing sets up a common platform for the services in the public administration. A unique digitized platform based on cloud computing has the possibility of increasing the collaboration among different agencies and different non-government organizations. Some colleges and universities use high-performance computing (HPC) to support academic research. Many of their workloads can now be supported in the cloud. Some of these organisations are offering classes in big data and analytics. Talking about the virtual computer lab for

advanced analytics, experts argue that some organisations could not offer this course at scale without the auto provisioning cloud architecture. Further, they use their data center, which hosts an academic community cloud, as a training site. Their students get direct experience with enterprise-scale architectures, preparing them for jobs in technology. (www.nextgov.com.)

Personalizing education and improving learning outcomes: Marist is also working to improve learning outcomes. These organisations led the Open Academics Analytics Initiative (OAAI) to “develop, deploy and release an open-source ecosystem for academic analytics designed to increase student content mastery, semester-to-semester persistence and degree completion in postsecondary education.” Thus far, they have learned to predict the likelihood of a student’s final grade, with a two percent error margin, within the first two weeks of a course. They have given the platform away to five other institutions and are learning to accurately interpret the data so as to implement more successful interventions. Other innovations are rapidly emerging by way of startup companies. One example is Learn metrics, a company that wants to make report cards obsolete. They have a cloud-based application that analyzes educational data to give teachers real-time insight into student performance. (Marinescu 2013, 23.)

2.4 Problems affecting the Performance of Cloud Computing Infrastructure

One of the objectives of this research work was to x-ray possible problems encountered in the use of Cloud Computing to pursue management efficiency. These problems would be examined from two perspectives: Problems faced during the acquisition of cloud computing infrastructure and those encountered during the operation of the CCCs.

2.4.1 Problems encountered in Setting up Cloud Computing Infrastructure

Under this section, the problems reviewed will be those from the time of acquisition of ICTs to the time when these ICTs have been put into use. There are several of these ongoing challenges to setting up of Cloud Computing Infrastructure. The most salient of these problems are discussed in the following paragraphs.

Insufficient funding, whereby obtaining enough finance for investing in Cloud Computing Infrastructure remains a challenge for every community. Most often the cost of the initial investment outlay is borne by the university community specially the students or their parents. Besides, donors from either national or international spheres are rare. Inadequate machine and material inputs is another setback, owing to the lack of enough financial resources and/or use of specialized consultants in IT which is not inexpensive too, most of the machine and material inputs are mostly below the expected specifications worthy of producing high performance results. (www.bcs.org.)

Furthermore, personnel who double as lecturers and IT managers are charged with the management of CCCs. These personnel have to engage in planning and implementation of the CCCs. This often puts a lot of pressure on them, which can subtract from their traditional teaching loads and leave inadequate time for the effective management of the CCCs in the after-school hours. Further reducing teaching loads and/or underwriting full-time managing staff to alternate between day and after-school use are possible solutions being explored to this problem. Identifying community needs wherein, an early challenge has been that of fitting relevant services for the higher education community within the context of the Cloud Computing. (www.bcs.org.)

2.4.2 Problems encountered when Running Cloud Computing Centres

Under this section, the problems reviewed will be those from the time of installation of the Cloud Computing Infrastructure. The journey towards Cloud Computing will require the organisation to overcome a number of hurdles. There are several of these ongoing challenges to running of CCCs and eventually benefiting from their use. The most common of these problems are discussed below.

The foremost of these may be concerns over data security. An issue that surveys consistently show is the number one concern about joining a cloud-based service environment. For the most part, however, the cloud providers have addressed the security issue. In any case, companies using cloud-based services should perform data security audits together with the cloud provider to ensure that their customer data is properly protected. (Judith et al 2009, 174.)

Desouza & Yukika (2005, 22) further discuss loss of skills and knowledge from the organization as a challenge to the smooth running of CCCs. Cloud-based solutions will facilitate moving processes beyond the organization's borders, companies need to have a very clear and deliberate strategy as to which

processes are to be owned and operated internally (mainly core processes) and which are less critical and strategic and, therefore, could be handled by a service provider. Once a company loses detailed knowledge of these non-core processes, it could be very difficult to re-establish them in-house.

Lastly, highly functional Cloud Computing Infrastructure must above all be manned by professionals in this domain and supervised by a professional management team as well. Also, electricity supply is mostly unreliable and so the need for a standby system is necessary yet coming at a cost that must be borne by the university community too, making its implementation difficult. Poor internet connection is a big menace to cloud computing, since it greatly depends on it for its smooth functioning (Doherty 2015, 512-527). From the foregone discussion on the problems that can affect the Performance of CCCs, this research also seeks to know how far these claims are true in the university communities understudy in the Cameroon as well as in Finland.

3 CONDUCTING THE RESEARCH

The approach adopted for researching this thesis is the qualitative research using case study methodology. The SWOT Analysis case study is used for this thesis. In this chapter, the approach of conducting this research is discussed in its first section. In the second section, case study methodology is presented as suitable for this research. The chapter ends with a presentation of the case organisations in section three.

3.1 The Approach

The IT field being a relatively new yet very dynamic field suffers from the problems of appropriate analytical models for use in research studies. Moreover, many experts argue that though there seems to be a blind acceptance that IT investments in general are different from other investments in organisational life, there is no evidence that this is a tested hypothesis. The argument therefore is clear: the problems of IT investments are the same as for normal investments and therefore, their solutions may also be the same. However, he suggests that new methodology be developed to handle IT related research. (Doom 2013, 29.) For this research, a qualitative research approach in the form of a case study is chosen to create a deeper understanding on how cloud computing can possibly enhance the efficiency of management of an organisation. (Yan 2017, 30.)

3.2 Data Gathering Method

According to Yan (2017, 31-35), case study is one of the most common methods used in qualitative research and it helps researchers to explore the holistic perspective of a real-world event. The SWOT analysis case study model is the methodology used to gather data for this research. By making a detailed study of the case organisations. In addition, only secondary sources of data have been used as the main source of material for this report. Publications and research work on CCCs in the educational sector were reviewed as well as concepts on management performance measures especially related with the management of higher education resources were also reviewed on the Internet and elsewhere to obtain information. Online sources as well as other electronic sources were mostly consulted, and substantial information was gotten from these e-sources. A list of text books were read for this research. Some of these books were

gotten from the Centria University library. The internet and friends were also useful secondary sources of data.

For each of the case organisations, background information, the management structure, and a SWOT analysis has been carried out. By gathering such data and information, the level of efficiency of management of each of the universities is then deduced.

3.3 The Centria University of Applied Sciences, Finland

Centria University of Applied Sciences (Centria UAS) is a public-recognized higher education institution in Finland that was created in 1991. The name Centria University of Applied Sciences is derived from Central Ostrobothnia University of Applied Sciences and officially used from the start of autumn semester 2012.

Centria is a multidisciplinary institution located in Western Finland, Northern Europe and offers 13-degree programmes in the fields of: Technology, Communications and Transport; Social Sciences, Business and Administration, Social Services, Health and Sports; Culture; Humanities and Education. The extent of UAS degree studies is generally 210–240 study points (ECTS), which means 3.5 – 4 years of full-time study. This education is arranged as degree programmes. The entry requirement is a certificate from an upper secondary school or the matriculation certificate, a vocational qualification or corresponding foreign studies. The requirement for Master's studies in UASs is a Bachelors' level UAS degree and at least three years of work experience. The UAS Master's, which is 60-90 study points and takes 1.5–2 years, is equivalent to a university Master's in the labour market. Each student has a personal study plan, which facilitates student guidance and the monitoring of progress in studies. Students apply for UAS studies in a national application system. The UASs determine the admission criteria and arrange student selection and entrance examination at their discretion. Nearly 90% of applications are submitted electronically. UASs also arrange adult education and open education geared to maintain and upgrade competencies. (Centria).

Centria University of Applied Sciences is owned by a limited liability company whose shareholders are the Central Ostrobothnia Education Group, Kalajoki Municipal Education and Training Consortium,

Pietarsaari City, Raudaskylä Christian College Association and Central Ostrobothnia Conservatory Support Association. At present, the rector of Centria University of Applied Sciences is Mr. Kari Ristimäki. (www.centria.finna.fi)

3.3.1 The Organisation Structure of the University

The structure of the Centria UAS consists of a short chain of command. At the helm of the Centria University of Applied Sciences is its CEO, rector in the person of Mr. Kari Ristimäki. He is directly assisted by two Directors: Director (Education) and Director (RDI) both of whom share an assistant: Assistant of directors. Directly answerable to these Directors are the Administrative and Financial Manager, Staff and communications Manager, Student Affairs Manager, IT Manager, International Affairs Manager, Information Services Manager and Security Manager. This structure depicts a decentralised system of management. In other words, decisions for each of the management activities are jointly made by top management and the subordinate staff of the institution. (www.centria.finna.fi)

3.3.2 A SWOT Analysis for the Centria UAS

According to Cole & Kelly (2011, 201), SWOT Analysis for an organisation can be captured in a three-stage process. As a process, SWOT Analysis for Centria UAS to meet up with the objectives of this research consists of the following basic steps.

External appraisals are first carried out in the external environment of the Centria UAS: This involves an assessment of the external environment of the university, in order to identify opportunities offered by and threats coming from CCCs in the Finnish economy, so as to convert the threats into opportunities and add to existing opportunities;

Secondly, an internal appraisal of the university is done: This involves an assessment of the internal environment of the university, in order to identify its strengths and weaknesses with respect to CCCs, convert the weaknesses into strengths and add to existing strengths;

Finally, strengths of the university are then matched with its attractive opportunities. The strengths of the university identified in step II are then used to develop plans that can take advantage of attractive opportunities identified in step I above. Based on the strengths and opportunities that can be exposed from the above SWOT analysis process, the Administration of Centria UAS can discover many possibilities of improving on the efficiency of management of the University.

According to James Bourne, editor in chief of TechForge Media, Finland has the highest proportion of enterprises in the EU using cloud computing, according to figures from Eurostat. The findings from the European Union's statistical office, from December 2014, saw more than half (51%) of Finnish enterprises in the cloud. Nordic and Benelux countries typically scored highly, with Sweden and Denmark in the top four and Netherlands and Belgium in the top 10. 24% of UK enterprises use cloud computing services. (www.cloudcomputing-news.net) Indeed Finland is home to a growing variety of ICTs including cloud computing applications as revealed in the research findings of Cheng Yan. (Yan 2017, 37-38.)

3.4 The University of Bamenda

The University of Bamenda (UBa) in Cameroon was created by a Presidential Decree n° 2010/371 on the 14th December 2010. It is the most recently created of the eight state Universities in Cameroon and has as primary concern to achieve the goals attributed to all the state Universities which include: Teaching, Research and Outreach. The University of Bamenda germinated out of a local initiative hatched in 1962 following reforms in the Educational Policy of West Cameroon. The mission of UBa is to equip students with universal knowledge in the arts, sciences and technology. (www.uniba-edu.cm)

The University of Bamenda germinated out of a local initiative hatched in 1962 following reforms in the Educational Policy of West Cameroon. The process was facilitated by the then Prime Minister and later Vice President of the Federal Republic of Cameroon Dr. John Ngu Foncha. Foncha's vision rested on the standard of higher learning reflective of the Nigerian Colleges of Arts, Science and Technology (NCAST). This wish was even more urgent because by 1961, the number of university graduates was grossly inadequate to cope with the senior staff demands of the new nation state. There were slightly over twenty university graduates in Southern Cameroon 1962 and the top civil service jobs by dint of this limitation were dominated by expatriates, mostly Nigerians and British. (www.uniba-edu.cm)

It was in dire need to alleviate this problem that the West Cameroon Government through its Education Policy Paper of July 1963 envisaged the Cameroon College of Arts, Science and Technology (CCAST) as a future college of the Federal University of Cameroon created in 1962. In the context of the imagination, it was to assume the status of an American Junior College or an English Polytechnic. This dream was somehow constrained by logistics and human resources. This perhaps explains why in 1963 when CCAST was transferred from its temporary site at GTTC Kumba to Bamili. (www.uniba-edu.cm.)

Between 1964 and 1966, landmark initiatives took place in CCAST which inaugurated the forty-three years (1967-2010) march towards an Anglo-Saxon styled University of Bamenda. Early in 1964 when Mr. (and later Dr.) Elias M. Nwana assumed interim responsibility as Principal of CCAST while Mr. Dioh went abroad for further studies, they thought it prudent to allay the acute dearth of trained teachers in Anglophone Cameroon secondary schools by giving a one-year pedagogic training to GCE A-Level holders to equip them with contents and aptitudes to teach in secondary schools. Besides, it was also a unique opportunity for Grade II teachers who were admitted along with secondary school leavers to prepare themselves for entry into universities. In 1966, the initiative was put in place and an Advanced College of Education attached to the then CCAST Bamili was initiated. A dozen students were enrolled to take the course. (www.uniba-edu.cm.)

3.4.1 The Organisation Structure of the University

Whereas, the structure of the University of Bamenda consists of a long chain of command. At the helm of the University of Bamenda is its Vice Chancellor in the person of Mrs. Akenji Theresia Nkuo who answers to the Minister of Higher education through a Pro-chancellor. She is directly assisted by two Deputy Vice Chancellors. Immediately next in hierarchy to the Deputy Vice Chancellors is the Registrar of the University who sees to the daily management of the University. Directly answerable to the Registrar are Directors of Administrative and Academic units of the University including Directors of its schools and Deans of its faculties. Sub-directors and Heads of Departments then follow suit. This structure depicts a more centralised system of management. In other words, decisions for each of the management activities of planning, organising, leading and controlling are mostly made by top management with a few consultations from subordinate staff. (www.uniba-edu.cm.)

3.4.2 A SWOT Analysis for UBa

According to Cole & Kelly (2011, 201), SWOT analysis for an organisation can be captured in a three-stage process. As a process, SWOT analysis for the University of Bamenda, in order to meet up with the objectives of this research consists of the following basic steps.

External appraisal is first carried out in the external environment of the University of Bamenda: This involves an assessment of the external environment of the university, in order to identify opportunities offered by and threats coming from CCCs in the Cameroonian economy, so as to convert the threats into opportunities and add to existing opportunities.

Secondly, internal appraisal of the university is done. This involves an assessment of the internal environment of the university, in order to identify its strengths and weaknesses with respect to CCCs, convert the weaknesses into strengths and add to existing strengths;

Finally, strengths of the university are then matched with its attractive opportunities. The strengths of the university identified in step II are then used to develop plans that can take advantage of attractive opportunities identified in step I above.

Worthy of note is the fact that on the 30th of March 2018, brand new laptops were distributed for free to students of the University of Bamenda. These laptops are capable of giving the students access to cloud services offered by various cloud computing service providers including the local telecommunication companies. This realized from the process of SWOT analysis above, as both a strength and an opportunity for the management of the university.

As another opportunity for the University of Bamenda, the Cameroon government now owns a data center which reflects the qualities of a CCC and which is housing all the systems necessary for the operation of computer applications. The data centre contains a secure and optimized physical environment, as well as all the software and hardware infrastructures that form the computer and telecommunications networks. The establishment of such an infrastructure will benefit Cameroon and Camtel, as it will allow the present and future needs of increasingly sharp and demanding users to be taken into account: renting or sharing of infrastructure; data hosting and servers; storing and saving data; outsourcing. Cloud computing-anything as a service (XAAS), software as a Service (SaaS), network as a service

(NAAS), communication as a service (CAAS), and platform as a service (PAAs). The Direct beneficiaries are many. The major ones include: operator of electronic communications networks; institutions and public administrations; international institutions and agencies; internet service providers; educational and research institutions; private administrative authorities. The indirect beneficiaries include: all users of electronic communications services and networks; all actors in the economic and socio-political sector and civil society. (www.camtel.cm.) Cameroon also enjoys the opportunity of the “SAIL” (South Atlantic Inter Link) from Brazil to Cameroon using optic fibre as shown in figure1 below.



FIGURE 1. The South Atlantic Inter Link – SAIL (adapted from Camtel 2018)

This optic fibre link increases the opportunities of businesses and non-profit making organisations like the University of Bamenda operating in Cameroon to have access to fast Internet services and hence make greater use of the government owned data centre. The connection of Cameroon to such an advanced network infrastructure will also benefit Cameroon and the state-owned telecommunication enterprise – Camtel, as it will allow the enhancement and effective use and development of its data centre, present and future needs of increasingly sharp and demanding users to be taken into account. Specifically, the South Atlantic Inter Link aims to: Modernize and adapt the structure of the national broadband network; Increase the capacity of the international telecommunications Services of Cameroon and the Central African sub-region; Devote the digital sovereignty of Cameroon. The SAIL is a welcomed development in Cameroon as Internet bandwidths are increasingly being demanded, and IT resources are being heavily solicited. This is why Camtel has found it necessary to adapt its network to these various needs, using the SAIL. The Question of satisfying both the users and operators, including the University

of Bamenda of telecommunications networks and services in Cameroon and the sub-region as a whole (www.camtel.cm).

4 DATA ANALYSIS & RESULTS

This chapter examines data collected from secondary sources in chapter 3 and explores the chances of enhancing efficiency of management. This chapter makes use of SWOT analysis to compare the level of efficiency in the management performance of Centria University of Applied Sciences with the level of efficiency in the management performance of the University of Bamenda. The stage by stage process of SWOT Analysis for each of the case organisations in the preceding chapter can be translated into a matrix form containing summary of information about the opportunities and threats, strengths and weaknesses of each of the case organisations as shown in figure 2 and figure 3 below.

<p><u>Opportunities</u></p> <ul style="list-style-type: none"> • Strong Finnish Economy • Strong Support from Government • Many Emerging Technologies including Cloud Computing Applications 	<p><u>Threats</u></p> <ul style="list-style-type: none"> • New competitors • Shortage of resources • Changing Needs of Students • New regulations • Substitute products
<p><u>Strengths</u></p> <ul style="list-style-type: none"> • Latest Technologies • Strong Financing • Strong Participatory Management • Skilled Workforce • Adequate R & D • Superior reputation 	<p><u>Weaknesses</u></p> <ul style="list-style-type: none"> • Lack of Direct Finance from government; • Tuition Fees as mean source of income.

FIGURE 2. A SWOT Analysis of Centria UAS (adapted from Cole & Kelly 2011, 201)

Based on information in the diagram (FIGURE 2) above, Centria UAS is matching its strength of a strong participatory management style to take full advantage of the abundance of cloud computing applications in Finland. For this main reason, there are higher chances that the use of CCCs can greatly contribute to enhancing the management efficiency of the university.

<p><u>Opportunities</u></p> <ul style="list-style-type: none"> • A low income Economy • Strong Support from Government • Many Emerging Technologies including Cloud Computing Applications 	<p><u>Threats</u></p> <ul style="list-style-type: none"> • Shortage of resources • Changing Needs of Students • Growing Competition • Frequent Power Failure
<p><u>Strengths</u></p> <ul style="list-style-type: none"> • Strong Financing • Weak Management • Skilled Workforce • 	<p><u>Weaknesses</u></p> <ul style="list-style-type: none"> • More Centralised Management • Wastes of Resources • Mismanagement • Inadequate R & D • Past planning failures

FIGURE 3. A SWOT Analysis of UBa (adapted from Cole & Kelly 2011, 201)

On the other hand based on information in figure 3, the University of Bamenda has similar and possibly greater opportunities with respect to emerging cloud technologies but lacks the relevant strengths to match with these opportunities. Its more centralized hence bureaucratic management style reduces its chances of making full use of CCCs that can greatly contribute to enhancing its management efficiency. This is evident by its wastes of resources which logically signifies the existence of inefficient management in the university as depicted in table 1 of chapter 2 this report.

Comparing the levels of efficiency therefore indicate that management is relatively more efficient in Centria UAS despite the fact that the University of Bamenda has similar exposure to cloud computing centres. Based on table 1, the level of efficiency of management of the University of Bamenda can mostly be qualified as Level 1, referring to the moderate level of efficiency in management performance of an organisation. This is evidenced by the fact that a SWOT analysis of UBa as shown in figure 3, indicates that despite the high financial support from the Cameroon government in the domain of ICTs; there are high levels of wastes of financial, material and/or human resources of the university. On a scale of 100, this level is rated at by between seventy percent and ninety nine percent.

Based on table 1, the level of efficiency of management of the Centria University of Applied Sciences can mostly be qualified as Level 3, referring to the high level of efficiency in management performance

of an organisation. This is evidenced by the fact that a SWOT analysis of Centria UAS as shown in figure 3, indicates high financial support from the Finnish government in the domain of ICTs and there are low levels of wastes of financial, material and/or human resources of the university. On a scale of 100, this level is rated at between seventy percent and ninety nine percent.

5 CONCLUSION

This report gives information about a comparison of how the proper use of cloud computing systems can help enhance efficiency of management of an organisation. The purpose of this study was to examine the possible impact of the use of CCCs and to account for the possible variance in the level of efficiency of the management of higher education resources in Cameroon and in Finland by answering the following research questions: What is the prevalent style of management in each of the case organisations? What is the level of efficiency of the management of higher education resources under study? Is there a variance in the level of efficiency of the management of higher education resources? In the previous chapter, I analysed data under the basis of the SWOT analysis case study model. To meet up with this end, the levels of management efficiency of two universities, one in Finland and the other in Cameroon were compared.

Our analysis was focused on the level of efficiency of the management of higher education resources and on the variance in the level of efficiency of the management of higher education resources in Finland as compared to Cameroon. In Finland, the level of efficiency in management of higher education resources as a consequence of the use of CCCs is relatively higher. However, in Cameroon, the level of efficiency in management of higher education resources is still low despite the efforts made by the Cameroon government to invest heavily in data centres and in ICTs for higher education.

In this research, I did not make use of primary sources of data. The thesis was therefore done with only the help of secondary sources of data. There was no major problem with obtaining books and e-books related to efficient management and cloud computing. However, it was more time consuming to obtain relevant information from these sources that were most suitable for the report. Given that the University of Bamenda is relatively a younger educational establishment, getting information from books about this university was almost impossible but its website and other related online sources were useful in this regard. This study did not consider all the elements of cloud computing that can enhance the efficiency of management.

Besides, there are many other factors that can account for high levels of efficiency of management which actually lie beyond the scope of this research. For instance, the human factor in universities may cause problems and failure or may lead to success depending on the behaviour of lecturers, students, parents and all the other members of the school community. Several university officials have stood accused of

blatant misappropriation of school funds. Some have misplaced priorities in financial spending. A clear example is where a school head decides to renovate dirty walls of lecture halls, when there is a desperate need for training material.

To round off, in a future research, it would be interesting to use a quantitative research approach. It would also be more enriching to see how each element of cloud computing is helping to enhance efficiency in management in many other organisations across the world. As the knowledge base grows, researchers would therefore need to pay more attention to the specific outcomes that are produced by different forms of cloud computing.

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