

# Integration of Information Systems in Higher Education: Current Status, Challenges, and Perspectives

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## ABSTRACT

The integration of Information Systems (IS) in higher education, particularly at the Higher Teacher Training College (HTTC) of the University of Yaoundé I, is part of a broader context of academic modernisation grounded in the digital governance of universities. This process was significantly and abruptly accelerated by the COVID-19 health crisis, which challenged traditional teaching methods and imposed an emergency shift toward digital transformation to ensure pedagogical continuity. The central problem addressed in this study is the gap between the digital governance requirements promoted by higher education authorities and the realities on the ground, which are characterised by fragmented initiatives, infrastructural challenges, and the absence of a structured institutional framework to sustainably manage digital change. Using a qualitative methodology based on semi-structured interviews and observations conducted within the Department of Chemistry at HTTC Yaoundé I, the findings reveal that although innovative tools such as Moodle and Google Classroom are in use, their implementation still largely depends on the individual initiative of lecturers. Despite the existence of hybrid training approaches in some teaching levels, the lack of pedagogical evaluation mechanisms and insufficient technological resources hinder sustainable integration. The study highlights that the success of this digital transformation requires not only increased technical investment but also the development of a clear institutional strategy, including stakeholder training and the formalisation of digital management procedures.

**Keywords:** information systems; higher education; integration; digital governance

## 1. INTRODUCTION

The digitalisation of teaching has become a major challenge for the academic modernisation of universities in general, and particularly for higher education institutions where teaching and learning activities take place. In an increasingly interconnected world, digitalisation is no longer a mere technical option; it has become a key lever for improving the quality of education. In this regard, the integration of digital tools in particular, and IS in general, into pedagogical practices is seen as a strategic approach to enhancing teaching quality, facilitating access to learning resources, and improving the efficiency of student management. Following the outbreak of the COVID-19 pandemic, which significantly affected the world at large and Cameroon in particular, the closure of schools and higher education institutions severely disrupted knowledge transmission across both state universities and professional schools, including one of the oldest teacher training institutions: the HTTC of the University of Yaoundé I. The integration of digital tools into teaching practices within this institution, and more specifically within the

Department of Chemistry, is part of a broader process of modernising higher education. It reflects the willingness of the institution to respond to the demands of digital governance promoted by university authorities. However, although several initiatives aimed at implementing digital tools have been introduced within the HTTC, they remain largely heterogeneous and lack a comprehensive framework that allows for optimal use of available resources. Against this backdrop, this study seeks, through the case of the Department of Chemistry at HTTC Yaoundé I, to provide an overall understanding of the integration of information systems in teaching. It aims to establish a clear assessment of existing practices within the department, identify the tools and conditions necessary for effective digitalisation, and analyse the governance mechanisms that could foster coherent digital education management and improve teaching effectiveness.

## 2. CONTEXT AND PROBLEM STATEMENT

The COVID-19 health crisis, which emerged in March 2020, acted as a sudden accelerator of digital transformation in Cameroon, as well as of higher

education modernisation policies. With the closure of educational institutions on March 18, 2020, more than 347,000 higher education students were abruptly confronted with a disruption of the traditional learning system (UNESCO, 2020). This emergency situation required a rapid transition to digital resources and the adoption of new pedagogical management techniques in order to ensure continuity in teaching and learning processes. This health crisis highlighted several major challenges:

**Infrastructure challenges:** These were observed at three levels within the digital domain. The first concerned access to digital devices and resources enabling the delivery of distance learning. The second involved the connectivity between digital tools and teaching content. Finally, one of the most critical issues was the compatibility of digital platforms with mobile devices, particularly smartphones.

**Pedagogical skills:** This is a crucial element of digitalisation and a key success factor. This challenge relates to the ability of both teachers and students to effectively master digital tools, as well as the underlying support policies for digital learning.

**Diversity of tools:** In response to the suspension of face-to-face classes, various distance learning strategies were adopted. The use of virtual classes, downloadable resources, and content sharing through social media platforms increased significantly to ensure pedagogical continuity.

**Fragmentation of initiatives:** In the absence of a strong institutional framework, the use of digital tools has largely depended on individual initiative rather than a structured departmental or institutional strategy.

However, the integration of digital technologies in Higher Education Institutions (HEIs) does not occur in a vacuum; it is guided by specific directives, notably Standard 32 of BIII Digital Governance, which defines the strategic requirements for information systems (MINESUP, 2015, p. 21). This regulatory framework guides the adaptation of digital technologies in higher education, particularly information systems, through the dematerialisation of internal processes and the pursuit of efficiency. The objective is to move from a heavy, paper-based administrative system to a more fluid and dynamic management approach based on integrated digital governance systems, in line with MINESUP's modernisation policy for teaching and learning.

Despite this institutional framework and the increased use of distance learning tools, several challenges related to the integration of digital technologies in teaching processes persist within higher education institutions, and the Chemistry Department of the HTTC is no exception. This research aims to examine the key drivers for effective and coherent integration of information systems in general, and digital tools in particular, in the

management of teaching activities. First, it situates information systems within the theoretical framework of the study, highlighting their various components as well as the factors influencing their implementation in a university environment. Second, it presents the research methodology, results, and analysis of the data collected in the field. Finally, the study provides conclusions and recommendations aimed at improving educational information systems in higher education institutions.

### 3. THEORETICAL FRAMEWORK

According to the definition provided by CAMES, an IS is used to "organise a set of resources (hardware, software, personnel, data, and procedures) that enables the collection, storage, processing, classification, and dissemination of information within a given environment" (CAMES, 2014, p. 22). Its role is to enable higher education institutions covering all post-secondary levels to carry out management functions, describe their activities, make forecasts, facilitate information sharing among stakeholders, support institutional governance, and report to supervisory authorities (Mars, 2015). In the field of education and training, Cassidy (2006) refers to these systems as "educational information systems." These are technological, organisational, and human arrangements that support the collection, processing, storage, and dissemination of pedagogical information. Thus, the integration of IS in higher education goes beyond simply installing computers on campuses, creating digital campuses, or uploading documents online. Rather, it is a process through which digital technologies are aligned with organisational structures, pedagogical methods, and the strategic objectives of universities in order to improve the quality of teaching and institutional management (Cassidy, 2006).

In Cameroon, this issue is at the core of higher education modernisation policies aimed at shifting from a traditional model to a more professional and digitally driven system. It forms part of the broader framework of digital governance in higher education. In this context, IS integration refers to the transition from an initial state of information systems to an improved and optimised state. This policy aims to establish new digital strategies enabling higher education institutions to (MINESUP, 2015):

- Develop a digital strategy that promotes modernisation and visibility of academic practices.
- Implement advanced infrastructure to support future technological developments.
- Adapt management and governance information systems to promote the dematerialisation of internal processes in an efficiency-driven approach;
- Ensure and facilitate access to content and services through innovative, coherent, and technology-appropriate platforms;
- Establish a differentiated and effective approach to student relations and academic life management;
- Integrate innovative services in teaching enhancement and research valorisation.

The integration of information systems, supported by digital governance in higher education, is mainly based on three pillars (Cassidy, 2006):

**3.1. Pillar 1: Infrastructure Integration**

Infrastructure integration refers to the establishment of Internet and Intranet networks, data centres designed to centralise institutional and academic information, and the provision of campus-wide Wi-Fi access in higher education institutions. This integration includes all technological infrastructures such as servers, connectivity systems, and digital learning devices available to learners. These devices are also referred to as “terminals,” which serve as direct access points between users and the system. Examples include computers, tablets, interactive whiteboards (IWBs), and smartphones. Terminals play several essential roles:

**Learning interface:** they serve as primary tools for accessing educational content, completing assignments, and facilitating interactions between teachers and learners.

**Digital inclusion:** They help reduce the digital divide by providing appropriate tools, especially for ensuring access to learning content during crises such as the COVID-19 pandemic.

**Content production:** they allow teachers to design instructional materials and enable students to produce their own work (projects, reports, portfolios), thereby actively participating in the learning process.

These technological infrastructures mainly fulfil two key functions:

**Knowledge dissemination,** through the delivery of educational content via digital channels;

**Data management** through the centralisation of information is necessary for institutional organisation and decision-making in higher education.

**3.2. Pillar 2: Pedagogical Integration**

Pedagogical integration is implemented through:

- The use of online learning platforms such as Moodle or Google Classroom;
- The implementation of Virtual Learning Environments (VLEs) for both staff and students;
- The availability of Open Educational Resources (OERs).

This integration is also reflected in virtual courses and digital teaching environments, including online classrooms and social media-based learning tools (mobile-supported content sharing) as learning facilitators (Cassidy, 2006). By integrating information systems into education, Cassidy (2006) emphasises that the effectiveness of an educational information system depends on the coherence between its components. Indeed, even a highly efficient software system becomes ineffective if the server infrastructure cannot support it or if learners lack appropriate devices to access it. Pedagogical integration, through its various digital components, can thus be summarised in the table below.

Synthesis: Integration of Digital Tools and Their Impact on Education		
Components	Main Function	Impact on Education
Servers	Storage and management of teaching materials	Ensures reliability and long-term preservation of knowledge
Connectivity	Circulation of information and teaching content	Promotes the democratisation of education and flexible access to learning resources
Supports (digital tools/platforms)	Interaction and content production	Enhances learner engagement and promotes autonomy in learning

**3.3 Pillar 3: Administrative Integration**

Administrative integration begins as soon as students enter the university system, starting with the digitalisation of enrollment processes, and continues throughout their academic journey through the tracking of records and the management of certifications. This process ensures transparency, efficiency, and effective governance in the management and administration of higher education institutions. An educational information system is not limited to the components that ensure its technical functioning or to digital tools designed to support pedagogical continuity. It also incorporates several key success factors that determine its effectiveness and sustainability. Among these critical success factors are the following:

**Accessibility:** This refers to the ability of digital tools to be compatible with users’ devices, particularly smartphones and computers. Accessibility enables both learners and teachers to access educational resources remotely (e-learning) or on the move, thereby promoting flexibility and continuity in learning.

**Human competencies:** This relates to the level of proficiency in the use of ICT tools, primarily among teachers and administrative staff, in order to achieve pedagogical and institutional objectives, and secondarily among students. Adequate digital literacy is essential for the effective implementation of information systems.

**Connectivity:** This concerns networks and data transmission systems. It represents the backbone of the educational information system (EIS). It includes cabling infrastructure, Wi-Fi networks, bandwidth capacity, and communication protocols. Connectivity ensures interoperability between different services (academic registry, library

systems, learning platforms), thereby facilitating smooth data exchange. Its reliability supports the rapid transmission of video streams for synchronous classes as well as the downloading of large academic files. All these elements are summarised in the table below.

Synthesis of the Components of an Educational Information System		
Determinants	Elements	Materialization
<b>Components</b>	Technological infrastructure	Servers, internet connectivity, digital support systems
	Gouvernance	Centralised management and coordination of digital systems
<b>Tools</b>	Platforms, virtual classrooms, and collaborative	Moodle, online courses, and social media platforms
	Connectivity	Institutional framework (often rigid), interoperability between systems, and operational fluidity
<b>Key Success Factors</b>	Accessibility	Availability of user devices (terminals) and access to remote learning resources
	Human components	ICT skills matrix, institutional support structure, and trained personnel responsible for system management

This synthesis highlights that an effective educational information system relies on a combination of robust technological infrastructure, effective governance, appropriate digital tools, strong connectivity, institutional flexibility, accessibility of resources, and adequately trained human capital.

#### 4. METHODOLOGY

The research methodology adopted in this study is based on a case study focusing on a higher education institution of the University of Yaoundé I: the Higher Teacher Training College (HTTC) (École Normale Supérieure – ENS) of Yaoundé. This pioneering institution within the Cameroonian education system has as its primary mission the training of secondary school teachers as well as guidance counsellors. The choice of this institution is justified by its long-standing history and its status among the country's major academic institutions. Since its creation to the present day, it has adapted to the digital transformations affecting higher education. The HTTC of Yaoundé also serves as a key environment for the development and dissemination of pedagogical strategies and knowledge. Furthermore, through the integration of an open-source digital tool, particularly the Moodle platform, the institution has implemented, following a directive from the Rector of the University of Yaoundé I, a blended learning policy consisting of 50% online courses and 50% face-to-face teaching.

The methodological approach adopted is qualitative. It is based, on the one hand, on semi-structured interviews and, on the other hand, on observations

of the use of the Moodle learning platform. The interviews were conducted with the Head of the Chemistry Department and the officer in charge of digital management at the HTTC. These actors are directly involved in the management and use of digital tools as well as in digital training systems. The Chemistry Department of the HTTC of the University of Yaoundé I is responsible for training future secondary school teachers in the field of chemistry. Within this institution, digital technology has become an essential tool for knowledge transmission and for improving teaching practices. The data collected from the department's officials were analysed using thematic analysis. This approach made it possible to identify the main themes related to ongoing digital practices, institutional mechanisms, departmental needs, and the prospects for the development of digital education.

#### 5. RESULTS

The findings of this study reveal several key insights regarding digital awareness and training in higher education institutions. First, although the Ministry of Higher Education (MINESUP) promotes the modernisation of teaching practices through digital integration, significant challenges remain in terms of digital training and capacity building among academic staff. It was observed that lecturers often have to finance their own digital equipment, such as laptops, internet access, and teaching tools. This situation limits equal access to digital resources and slows down the effective adoption of information systems in teaching practices.

There is a strong need to reinforce awareness and training of lecturers on the fundamental concepts of information systems. Insufficient mastery of these tools reduces their effective use in daily teaching activities and weakens the impact of digital transformation initiatives. In addition, digital skills among lecturers are unevenly distributed, creating disparities in teaching quality across departments and modules. This imbalance results in a digital divide within the institution, where some courses effectively integrate ICT tools while others remain largely traditional. The study highlights the importance of involving all stakeholders, lecturers, administrators, students, and technical services during the design and implementation of digital solutions. Without collective ownership and adequate training, information systems risk being underused or poorly implemented, thereby limiting their contribution to improving the quality of higher education.

The qualitative findings of this study highlight the current state of integration of information systems in higher education institutions, the challenges faced by stakeholders, and the future perspectives for improving digital transformation in universities. The data were collected through semi-structured interviews with academic staff, IT administrators, and institutional managers. The results of this research, drawn from interviews with officials of the HTTC of Yaoundé and from direct observations, are presented in two main sections. The first focuses on the state of digitisation of teaching practices, while the second examines the integration of information systems within the Department of Chemistry at HTTC. Regarding the understanding of information systems in higher education, respondents emphasised their central role in transforming academic environments. Respondent A (Lecturer) noted that in the future, *everything will become digital, including examinations, lectures, and supervision processes*. Similarly, Respondent B (IT Administrator) highlighted that *institutions are progressively moving toward fully integrated smart campuses characterised by automated systems and data-driven decision-making*.

The strong expectation of full digital transformation and smart university systems reflects a growing awareness among stakeholders of the need to modernise higher education institutions through technology. This perspective suggests that universities are increasingly viewed not only as traditional learning spaces but also as interconnected digital ecosystems where teaching, learning, assessment, and administration are fully supported by integrated information systems. This expectation also indicates a shift toward data-driven decision-making, where academic and administrative processes are enhanced through real-time access to information. Smart university systems are seen as a means to improve efficiency, transparency, and service delivery while reducing bureaucratic delays and manual errors. However, this anticipated transformation also implies the need for substantial investment in digital

infrastructure, staff training, and institutional policy reforms. Without these supporting conditions, the vision of a fully digital and smart university may remain aspirational rather than operational. What is the current state of information systems integration in your institution? Respondent C (Administrator):

The integration of information systems within the institution remains partial and uneven across departments. While some departments have effectively adopted digital platforms for teaching, learning, and administrative tasks, others continue to rely heavily on traditional manual processes. This disparity reflects differences in digital readiness, access to infrastructure, and levels of staff training. In departments where digital platforms are actively used, there is improved efficiency in course management, communication, and student assessment. Conversely, departments still operating manually experience delays in information processing, reduced coordination, and limited access to real-time academic data. This situation highlights a transitional phase in the digital transformation process, where full integration has not yet been achieved across the institution.

The findings suggest that although noticeable progress has been made in the integration of information systems within the institution, this progress remains uneven and fragmented across departments. Some units have successfully adopted digital tools for teaching, administration, and communication, while others continue to rely on traditional, manual procedures, limiting overall institutional efficiency. This situation indicates the absence of a fully harmonised implementation framework guiding digital transformation across the university. As a result, disparities persist in digital competence, access to technological infrastructure, and the effective use of information systems among departments. Such inconsistencies can negatively affect coordination, data sharing, and the overall quality of academic and administrative services. Therefore, a more coordinated institutional strategy is required to ensure uniform adoption of information systems. This includes the development of clear digital policies, compulsory training programs for staff, adequate investment in ICT infrastructure, and continuous monitoring and evaluation mechanisms. A structured and inclusive approach would help harmonise practices across departments and accelerate the transition toward a fully integrated digital university system.

#### **How do information systems impact teaching and learning?**

**Respondent A (Lecturer):** *They make learning more flexible because students can access course materials at any time through digital platforms. However, a major challenge is that not all students possess sufficient digital literacy skills, which affects their ability to fully benefit from these systems.*

**Respondent D (Student Representative):** *Information systems are very helpful because they allow us to access lecture notes, submit assignments*

online, and communicate with lecturers more easily. However, we sometimes face difficulties such as system failures, slow connectivity, or platform instability, which disrupt learning activities. The findings indicate that information systems have a positive impact on teaching and learning by improving accessibility, flexibility, and communication between lecturers and students. Learners are able to access educational resources beyond the constraints of time and physical presence, which supports more autonomous and continuous learning. However, the effectiveness of these systems is limited by several operational challenges, including inadequate digital literacy among some students and recurring technical issues such as poor system performance and unstable internet connectivity. These constraints reduce the full potential of digital platforms in enhancing academic performance. While information systems significantly enrich the teaching and learning process, their success depends on improved digital skills development and the reliability of technological infrastructure within the institution.

#### **What improvements are needed for better integration? Respondent B (IT Administrator)**

*We need better technological infrastructure, regular training programs for staff and students, and stable internet access across the entire campus. Without these resources, the effective use of information systems becomes difficult.*

**Respondent C (Administrator):** *The institution should implement and enforce a comprehensive digital policy that obliges all departments to adopt and effectively use information systems in their academic and administrative activities.* The responses from stakeholders highlight the urgent need for a more structured and institutionalised approach to the integration of information systems in higher education. Participants emphasised that effective digital transformation cannot be achieved without adequate technological infrastructure, such as reliable computers, servers, digital platforms, and high-speed internet connectivity. The findings also underscore the importance of capacity building through continuous training programs for lecturers, administrators, and students. Such training would improve digital literacy, increase confidence in the use of technology, and reduce resistance to change among users.

Respondents stressed the need for clear institutional policies that guide and regulate the adoption of information systems across all departments. Policy enforcement would help standardise digital practices, ensure accountability, and promote a culture of innovation within the institution. Stakeholders emphasise that successful integration of information systems depends on three major factors: effective policy implementation, continuous human capacity development, and sustained investment in digital infrastructure.

#### **What are the future perspectives of information systems in higher education? Respondent A**

**(Lecturer):** In the future, everything in higher education is expected to become digitalised, including examinations, lectures, supervision, and academic evaluations. Teaching and learning activities will increasingly rely on online platforms and virtual classrooms. Students will have easier access to learning resources from any location and at any time. Digital systems will also simplify communication between lecturers and students. This transformation is expected to make education more flexible, interactive, and efficient.

**Respondent B (IT Administrator):** We are progressively moving toward fully integrated smart campuses where most academic and administrative activities will be automated. Information systems will connect departments, students, lecturers, and management through centralised digital platforms. Decision-making processes will increasingly rely on data analytics and real-time information. Artificial intelligence and cloud computing will improve institutional efficiency and service delivery. Automated attendance systems, online assessments, and digital records management will become common practices. Smart campuses will also enhance security, communication, and resource management. Digital transformation will redefine the way universities operate and deliver education.

#### **5.1. Digitalisation of Teaching and Future Perspectives in Higher Education**

The responses reveal a strong expectation that higher education institutions will undergo a complete digital transformation in the coming years. Stakeholders believe that information systems will become central to all academic and administrative activities. The findings suggest that universities are gradually transitioning toward smart campus models characterised by automation, connectivity, and data-driven management. This transformation is expected to improve efficiency, accessibility, communication, and the quality of service delivery. The integration of advanced technologies such as artificial intelligence, cloud computing, and learning management systems will further modernise teaching and learning processes. Respondents also emphasise that digital platforms will strengthen collaboration among institutional actors and facilitate real-time access to information. However, achieving these objectives will require substantial investment in technological infrastructure, staff training, and institutional policies. The findings, therefore, indicate that the future of higher education largely depends on the successful integration and effective management of information systems.

#### **5.2. State of Digitalisation of Teaching**

The assessment of the state of digitalisation in higher education goes beyond the simple counting of digital equipment such as computers, projectors, or the uploading of pedagogical content and academic documents. Digitalisation is a comprehensive and dynamic process aimed at aligning digital technologies with organisational structures, pedagogical methods, and the strategic objectives of

university departments and institutions. In this regard, the integration of digital systems seeks not only to modernise teaching practices but also to improve the quality of learning, enhance access to educational resources, and increase the efficiency of academic management. It involves the use of learning platforms such as Moodle, video conferencing tools, digital libraries, student management systems, and collaborative spaces that promote interaction between teachers and learners. Within higher education institutions, this digital transformation is reflected in the gradual development of blended learning and distance education programs, the automation of certain administrative tasks, and the digitalisation of assessments and academic procedures. However, the level of digitalisation varies from one institution to another depending on available infrastructure, the digital competencies of teachers and students, and institutional policies. Furthermore, several challenges continue to hinder this evolution, including inadequate technological equipment, unstable internet connectivity, insufficient training of stakeholders, and resistance to change among some teachers. Despite these challenges, the digitalisation of teaching represents an essential driver of pedagogical innovation and academic performance improvement in higher education.

### 5.3. Current Situation

Regarding the current state of digitalisation within the department, the data collected led to the following findings:

- There is difficulty in identifying a single institutional system for the digitalisation of teaching activities. Indeed, the department does not have a dedicated structure responsible for the centralised management and digital transformation of pedagogical content.
- Although the department has a focal point responsible for assisting and guiding lecturers in the process of digitalising their teaching, most lecturers develop their digital skills independently through personal initiatives of learning and professional development.
- The main digital platforms and open-source tools used within the campus include Google Classroom and Moodle. These tools facilitate the uploading of course materials, pedagogical communication, and the monitoring of academic activities.
- Under the guidance of the university administration and in accordance with a directive from the Rector of the University of Yaoundé I, teaching is organised through a blended learning approach. This policy requires lecturers to deliver 50% of their courses in face-to-face mode and 50% online, in order to strengthen the integration of digital tools into teaching practices.
- However, a digital divide remains evident within the department. This gap is associated with inequalities in access to digital equipment, insufficient technological resources, and unstable internet connectivity, all of which limit the effectiveness of digital teaching and equitable access to learning opportunities.

#### Summary of the Components of Digitalisation

Components of Digitalisation	Key Findings
Information System (IS) Structure	Non-existent
Focal Point for Digitalisation	Predominantly individual/personal rather than institutionally developed
Digital Skills	Exists
Digital Tools: Learning Platforms	Exists: Moodle
Reference Document	Exists: Rector's Circular/Directive
Sharing and Communication Tools	Exists: Social media platforms (WhatsApp, etc.)

The findings indicate that the digitalisation process within the institution is partially established. While several digital tools and mechanisms, such as Moodle, virtual classrooms, and social media communication channels, are operational, there is no formally structured Information System (IS) dedicated to coordinating digital activities. Digital competencies largely depend on individual initiatives rather than institutional capacity-building programs. The existence of a focal point and official reference documents demonstrates institutional commitment to digital transformation; however, greater efforts are needed to establish a comprehensive information system and strengthen staff digital competencies.

### 5.4. Assessment and Optimisation of Teaching

- There are currently no comprehensive and systematic digital mechanisms for the pedagogical evaluation of teaching within the institution. Teaching assessment remains largely based on traditional administrative practices, with limited integration of digital technologies.
- The monitoring and evaluation of teaching activities primarily focus on verifying the progress of academic programs and course content through the use of the "teaching record book" (cahier de textes). While this tool enables administrators to track course coverage and instructional progress, it remains limited in its capacity to provide qualitative analyses of learning outcomes and teaching effectiveness.

- As part of the ongoing digitalisation of education, digital learning materials, online courses, and various pedagogical activities, including document uploads, teacher-student interactions, assignments, and exercises, are monitored through the Moodle learning management system. This platform facilitates access to educational resources, enhances academic communication, and supports continuity in teaching and learning processes.
- Despite these advancements, several challenges persist. These include inadequate digital infrastructure, limited technological proficiency among some teachers and students, and the absence of an integrated digital system for assessing student learning and academic performance. Addressing these challenges is essential for improving the effectiveness and

sustainability of digital teaching and learning initiatives within the institution.

The various components involved in the evaluation and optimisation of teaching and learning processes are summarised in the table above. These components provide a comprehensive framework for assessing the effectiveness of instructional practices and the integration of digital technologies in education. They include indicators related to teaching performance, student engagement, content accessibility, and the use of learning management systems. By monitoring these elements, educational institutions can identify strengths and areas requiring improvement. Consequently, such evaluations support evidence-based decision-making and contribute to the continuous enhancement of teaching quality and student learning outcomes.

Summary of Teaching Evaluation and Optimisation	
Components of Teaching Evaluation and Optimisation	Key Findings
Digital tools for teaching evaluation	Non-existent
Teaching evaluation indicators	Available: number of uploaded contents and frequency of use of the open-source platform
Digital tools for managing teaching content	Available

The findings indicate that while digital tools for managing teaching content are available and actively used, there are currently no dedicated digital tools specifically designed for the evaluation of teaching practices. Nevertheless, certain evaluation indicators exist, including the quantity of educational content uploaded and the frequency with which instructors use the open-source learning platform. These indicators provide a basic measure of digital engagement but remain insufficient for a comprehensive assessment of teaching effectiveness and quality. Consequently, there is a need to develop and implement more robust digital evaluation systems capable of supporting continuous improvement and optimisation of teaching and learning processes.

### 5.5. Digital Management and Monitoring of Teaching Activities

The digital management and monitoring of teaching activities are conducted externally to the department. This responsibility primarily falls under the Information Technology Unit of the HTTC, which centralises data related to the use of digital learning platforms. The IT Unit is therefore the sole entity authorised to generate statistics concerning the management and monitoring of digital teaching activities within the department. These statistics are used to assess the level of integration of digital technologies into teachers' pedagogical practices.

These indicators serve not only to evaluate the degree of integration of educational technologies but also to influence certain aspects of teachers' remuneration and professional recognition, particularly for those actively involved in digital pedagogical innovation. Examples of Statistical Indicators Used.

- Frequency of digital platform usage by teachers;
- Student consultation rates of online learning materials;
- Quantity of educational resources and course content uploaded to the platforms;
- Number of interactive learning activities made available online;
- Student participation rates in digital learning activities.
- Teachers who have successfully digitalised their courses may be eligible for a digitalisation incentive bonus. This bonus is awarded based on clearly defined performance indicators that measure the actual level of course digitalisation and the degree of teacher engagement in digital teaching and learning initiatives.
- Through these mechanisms, the institution seeks to encourage the effective use of digital technologies, promote innovative teaching practices, and enhance the quality of education through data-driven monitoring and evaluation.

Management and Monitoring of Teaching Activities	
Components of Teaching Management and Monitoring	Key Findings
Organizational Structure	Managed by an external institutional unit rather than the department itself
Monitoring Indicators	Available and operational
Teaching Digitalisation Allowance	Available for eligible lecturers who digitise their courses

### 5.6. Integration of Information Systems

The integration of IS in higher education goes beyond the mere installation of computers or the simple uploading of teaching materials online. It refers to a comprehensive and structured process through which digital technologies are aligned with organisational structures, pedagogical practices, and the strategic objectives of universities in order to improve the quality of teaching, learning, and institutional management. This integration is primarily based on ensuring coherence between the identified needs within the institution and the digital solutions implemented. Universities must assess the expectations of lecturers, students, and administrative staff in order to develop digital systems that respond effectively to pedagogical and administrative realities. These needs may relate to course management, access to learning resources, student assessment, academic communication, and administrative monitoring of learners. The integration of Information Systems largely depends on the availability and quality of digital resources. These include learning management systems such as Moodle, computer equipment, internet infrastructure, academic databases, and university management software. Such resources constitute essential tools that support teaching activities and promote a more interactive and collaborative learning environment. The integration of Information Systems is also reflected in the digital practices adopted by university stakeholders. Lecturers are increasingly required to transform their teaching methods through the use of multimedia resources, online learning platforms, digital assessment tools, and virtual communication technologies. Likewise, students develop digital competencies that foster autonomy, information-seeking skills, and collaborative learning. Consequently, Information Systems contribute to the gradual emergence of innovative teaching and learning approaches centred on pedagogical innovation.

Moreover, the successful integration of Information Systems requires a clear institutional policy and effective change management strategies. University leaders must establish coherent digital transformation plans, provide continuous training for academic and administrative staff, and promote a culture that embraces technological innovation. Change management is therefore essential for reducing resistance, supporting users in adopting digital tools, and ensuring the sustainable use of Information Systems. The integration of Information

Systems in higher education represents a major driver of university modernisation. When properly planned and supported, it not only enhances the quality of teaching and administrative services but also strengthens the competitiveness and attractiveness of higher education institutions in an era characterised by rapid global digital transformation.

### 5.7. Identified Needs

Based on the presentation of the department's current situation, it is evident that despite the existence of certain digital resources and technological systems, several shortcomings persist and limit the effective integration of Information and Communication Technologies (ICTs) into teaching and learning practices. These deficiencies mainly relate to infrastructure, equipment, internet connectivity, and the availability of digital tools adapted to the local institutional context. The findings suggest a pressing need to strengthen technological infrastructure, improve access to reliable digital equipment, and ensure stable and affordable internet connectivity for both lecturers and students. Furthermore, there is a need for the development and deployment of digital solutions that are tailored to the specific realities and requirements of the institution. Addressing these challenges would enhance the effectiveness of digital learning environments, support innovative pedagogical practices, and contribute to the overall quality of higher education delivery.

#### 5.7.1. Need for Appropriate Digital Equipment

The department expresses a significant need for technological equipment to optimise both face-to-face and hybrid teaching. Among the most requested resources are multimedia projectors, computers, interactive digital whiteboards, printers, and sound systems. The shortage of these tools limits the implementation of innovative teaching methods and reduces opportunities for effectively integrating multimedia resources into classroom instruction. Regular use of audiovisual materials would enhance student engagement, make learning more interactive and appealing, and better align teaching practices with the demands of contemporary higher education.

#### 5.7.2. Need for Stable and Accessible Internet Connectivity

One of the major challenges identified concerns the quality of internet connectivity on campus. Both lecturers and students frequently experience unstable,

slow, or occasionally unavailable internet access, which hinders the use of learning management systems, access to online scientific resources, and participation in distance learning activities. A stable, high-speed, and widely accessible internet connection is therefore essential for ensuring the effectiveness of digital learning environments and supporting continuity in teaching and learning processes. Strengthening internet infrastructure would not only improve access to educational resources but also facilitate communication, collaboration, research activities, and the overall digital transformation of higher education institutions.

#### 5.7.3. *Need for Institutional Support for Digital Infrastructure*

The results also show that several lecturers use their personal equipment to carry out digital teaching activities. This situation represents a significant financial and organisational burden for teaching staff. The department therefore emphasises the need for the institution to provide adequate digital infrastructure, including service computers, software licenses, multimedia classrooms, and fully functional institutional platforms. Greater institutional involvement would help to promote equity among lecturers and further encourage the integration of digital technologies into teaching practices.

#### 5.7.4. *Need for the Development of a Local Digital Platform*

Another major need identified is the development of an internal digital application capable of serving as an alternative to platforms such as Google Classroom or Moodle. Although these tools are widely used, they sometimes present limitations related to maintenance costs, technological dependence on external providers, and limited adaptation to the local context. The development of an institutional local platform would provide a more cost-effective, flexible, and context-appropriate solution tailored to the pedagogical, economic, and technological realities of Cameroonian universities. Such a platform could also enhance course management, student tracking, sharing of teaching resources, and communication between lecturers and learners, thereby improving the overall efficiency of the teaching and learning process.

### 5.8. Digital Resources

During the study, several needs related to digital resources were identified within the department. Although some digital tools are already used in teaching and administrative practices, the respondents highlighted the insufficiency of accessible digital learning and research materials for both lecturers and students. One of the main needs expressed is the establishment of an institutional digital library. Such an infrastructure would enable the academic community to access up-to-date scientific resources, particularly from major international publishers such as Elsevier, Springer, Wiley, Taylor & Francis, and Sage Publications. Access to these scientific databases would

significantly enhance the quality of teaching, research activities, and academic outputs within the institution. Respondents also emphasised the importance of developing institutional subscription agreements with these scientific publishers. Indeed, the high cost of individual access to academic articles and books represents a major barrier to research development. Collective subscriptions or institutional partnerships would therefore help democratize access to scientific information for lecturers, students, and researchers in the department. The creation of an internal digital library accessible via a departmental intranet was suggested. This internal repository could centralise lecture notes, student dissertations, theses, internship reports, lecturers' publications, and other relevant pedagogical materials. Such a system would promote knowledge sharing, preserve local academic outputs, and ensure quick access to learning resources, even in contexts of limited internet connectivity. These needs reflect the willingness of academic stakeholders to modernise the teaching and research environment through appropriate digital infrastructures. The development of digital resources thus appears as a key condition for improving the quality of higher education, promoting pedagogical innovation, and strengthening the scientific competitiveness of the institution.

### 5.9. Digital Change Management

Digital change management is a major challenge in the integration of information systems within higher education institutions. Although digital tools are progressively being introduced into both pedagogical and administrative practices, their appropriation remains constrained by several organisational and managerial difficulties. Beyond the fact that some lecturers and administrative staff still perceive information systems as an additional workload, the findings reveal the absence of a structured mechanism for managing digital transformation. This situation is reflected in the lack of clearly defined procedures, insufficient distribution of responsibilities, and the absence of a formal framework for monitoring and evaluating digitalisation activities. Although digital focal points exist in some departments, their role remains limited. They mainly serve as technical relays or resource persons supporting lecturers in the use of digital platforms. However, they do not have sufficient decision-making autonomy or the necessary organisational resources to drive a real digital transformation process within departments. The study also highlights weak managerial organisation around the digitalisation of teaching practices. Digital initiatives are often fragmented, individualised, and poorly coordinated. This situation is further worsened by the absence of official memoranda, regulatory texts, or internal administrative documents clearly defining and guiding digital practices at the departmental level. As a result, the digital transformation process relies more on individual initiatives from lecturers rather than on a coherent and sustainable institutional strategy.

This lack of structured digital governance limits the effectiveness of information systems and slows down the adoption of educational technologies by all stakeholders. An effective digital change management process, therefore, requires the establishment of a clear institutional policy, supported by coordination mechanisms, continuous training, monitoring and evaluation systems, and a regulatory framework that promotes the active engagement of both academic and administrative staff in the digital transformation of higher education.

#### 5.10. Digital Awareness and Training

Although the MINESUP promotes the modernisation of teaching practices through the integration of digital technologies, several shortcomings remain in terms of training and awareness-raising among stakeholders. First, it is observed that lecturers are often required to personally finance part of their digital equipment (computers, internet access, or teaching tools). This situation limits equity in the adoption of educational technologies and hinders the smooth integration of information systems into teaching practices. Secondly, there is a strong need to reinforce awareness and training of lecturers in the fundamental concepts of information systems. Indeed, insufficient mastery of these tools reduces their effective use in daily pedagogical practices and weakens the overall impact of implemented digital solutions. Furthermore, lecturers' digital competencies remain unevenly distributed, creating disparities in teaching quality across departments and modules. This situation leads to a pedagogical divide, where some courses fully benefit from digital tools while others remain rooted in traditional teaching approaches. Finally, it is essential to involve all stakeholders (lecturers, administrators, students, and technical services) from the design and implementation phases of digital solutions. Without collective ownership and adequate support, information systems risk being underused or poorly exploited, thereby reducing their effectiveness in improving the quality of higher education.

#### 6. DISCUSSION

The results show that the department does not have a single institutional system dedicated to the full digitalisation of teaching. Lecturers partially use digital platforms for knowledge delivery, with Google Classroom and Moodle being the most commonly used tools. Since teaching is hybrid, it combines 50% face-to-face instruction and 50% online learning. In addition, the evaluation of teaching practices remains limited to monitoring syllabus coverage, with no structured pedagogical evaluation system in place. However, the institution's IT unit plays a central role in the quantitative monitoring of platform usage, including indicators such as login frequency, content uploads, and student consultation rates. The needs identified mainly concern the provision of adequate digital equipment, reliable internet connectivity, the establishment of an institutional digital library, and the development of an internal e-learning application to support pedagogical activities. The

findings also highlight a gap between higher education digitalisation governance and institutional realities. The absence of formal digital management mechanisms, combined with weak implementation of change management policies, limits the effective appropriation of digital tools by both lecturers and students. Although digital focal points exist within departments, their actions remain largely reactive and are not fully integrated into a comprehensive institutional digital strategy. These observations are consistent with the literature on digital governance, which emphasises the importance of a clear digitalisation strategy, adequate infrastructure, effective information systems management, and the integration of innovative services to ensure the successful implementation of educational information systems projects.

#### 7. CONCLUSION AND PERSPECTIVES

In conclusion, the analysis of Educational Information Systems (EIS) within the Department of Chemistry at HTTC reveals that their integration does not depend solely on the availability of digital tools, but is mainly shaped by an organisational and institutional culture. Indeed, although digital resources exist, they are not always adequately designed, coordinated, or fully managed by the institution. The main challenge, therefore, lies in the structuring of digital systems, the strengthening of stakeholder training, and the institution's commitment to sustained investment in educational digitalisation. According to e-learning and blended learning approaches, effective digital integration depends not only on the availability of technological tools but also on the training of users, the appropriation of technologies, and the establishment of clear governance mechanisms. Change management in digital transformation thus appears as a key factor in ensuring alignment between pedagogical objectives and technological solutions. Consequently, even though digital initiatives and tools exist, their impact remains limited in the absence of a coherent and well-structured institutional policy. In this perspective, and in line with Mars (2015), it is recommended to:

- Develop an institutional strategy for the digital transformation of teaching and learning;
- Establish formal procedures for the digitisation of courses;
- Strengthen the digital skills of teachers and administrative staff;
- Invest in digital infrastructure and improve access to stable internet connectivity;
- Develop a secure, integrated, and user-friendly internal digital platform;
- Structure and enhance the role of digital focal points within academic departments.

These actions promote a sustainable and effective integration of information systems in higher education, thereby improving access to learning resources, enhancing the digital competencies of teachers and students, and adapting pedagogical practices to hybrid and fully digital learning environments.

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