Empirical Article

OJED
OPEN JOURNALS IN EDUCATION

Volume 16, Issue 2 (2024), pp. 117-126
Journal of Comparative & International Higher Education
Online | https://ojed.org/jcihe

A Study of Digitalization of Higher Education Institutions in the Caribbean

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This article was not written with the assistance of any Artificial Intelligence (AI) technology, including ChatGPT or other support technologies.

Abstract

As technology integration advances, higher education institutions (HEIs) are experiencing varying degrees of digitalization of their systems, processes and services. This qualitative study explores the status of technology integration and the digital infrastructure of five higher education institutions within the Caribbean. It seeks to answer three questions: i) what is the level of digitization in the institutions' systems? ii) what is the status of technology integration in the teaching-learning processes in the institutions? iii) what types of digital infrastructures are in place to support the institutional functions? The analysis of the data reveals advances in the digitalization of a number of areas including communication processes, administrative processes, the student life cycle processes and in teaching and learning. This study provides important insights into the evolving landscape of digitalization of higher education within the Caribbean, and should serve to inform policy and practice in this important area.

Keywords: Caribbean higher education, digitization in higher education

Introduction

Digitalization is changing every aspect of human life including education. Consequently, institutions of higher education must be flexible and adaptive if they are to maintain their relevance in contemporary societies and maintain their role in shaping the future of societies. Therefore, the digitalization of higher education institutions, which in this paper refers to the integration of technology and various digital tools in the teaching and learning, administrative and support processes

Received April 8, 2023; revised June 1, 2023; accepted September 1, 2023

of education, is crucial. Higher education institutions must respond to this context by ensuring that their systems and processes for teaching and learning and administration are digitalized to ensure their graduates are prepared to function effectively within their context. Against this backdrop digitalization in higher education is gaining more and more prominence and it is seen as a means of making higher education not only more accessible, but also flexible and personalized.

Further, digitalization has taken on greater importance as a way of survival for higher education institutions. The notion of digitalization as a goal resting in a strategic plan or an option to be further discussed for consideration, is for any institution a suicidal approach to survival. Additionally, the Covid-19 Global pandemic helped to advance efforts in the education sphere because of the almost two-years isolation that many countries experienced. This resulted in increased levels of digitalization to initially provide emergency remote teaching and learning experiences for learners who were unable to meet for traditional face-to-face experiences. As the world slowly returns to normalcy and as new strains of the virus continue to be detected more and more institutions are advancing digitalization efforts. The Caribbean is no exception.

Moreover, there is growing consensus that digital tools serve to enhance the teaching learning process making the learning experience more easily accessible, engaging, interactive, collaborative, and participatory. These are all approaches that are valued in the 21st Century classroom as we prepare students for the world of work and to contribute to their society.

While we are aware of the many benefits of digitalized education, we are also aware that the pace of digitalization varies across geographic regions and among high-income, upper middle income, lower middle income and low-income countries. Against this background the purpose of this paper is to explore the status of digitalization among five higher education institutions within five Caribbean Countries: Jamaica, Trinidad and Tobago, The Bahamas, Barbados and Turks and Caicos Island.

The Caribbean (both English- and non-English-speaking countries), comprises approximately 42 million people scattered across 30 territories. Many of the nations emerged from positions of massive foreign political domination to independence and self-governance (Alfred et al., 2011). Within this context higher education is viewed as an important sector for economic growth and development, as it helps to produce skilled professionals who can contribute to their respective countries' workforce and overall development. However, the countries share a distinctiveness of low growth and vulnerable economies that consistently operate within very tight fiscal spaces with high public debt. The resulting increase in debt service payments crowd out the productive expenditure needed for the sustainable provision of public services one of which is quality education of the citizens. Making quality higher education accessible to all of its citizens is therefore a challenge. However, a recent study by Brown and Shen (2017) found that increased access in higher education has risen tremendously due to accessibility of technology among other factors.

Higher education in the Caribbean varies among countries, but generally follows a similar structure as in other parts of the world. The Caribbean has a mix of over 50 public and private institutions, (Beckles & Richards-Kennedy, 2021) including universities, and colleges offering a variety of programmes ranging from, certificates to diplomas, associate degrees, undergraduate and graduate degree programmes in a range of fields. In addition, there are also several community colleges and vocational schools throughout the Caribbean that provide technical and vocational education and training (TVET) programmes. Despite the increased access in higher education highlighted by Brown and Shen (2017) Caribbean's tertiary enrolment rate is less than 25% compared with the North American average of near 60% and the Latin America average of 52% (The World Bank, 2020).

Literature Review

As technology integration advances, higher education institutions (HEIs) are experiencing and or aiming for varying degrees of digitalization for teaching and learning, administrative and technical related activities and services. This literature review examines the concept of digitalization within HEIs generally and specifically within the Caribbean to include: the level of digitalization in institution systems, a review of HEI infrastructure, digitalization of the teaching and learning process, of administrative systems, and institutional services, and of resources for digitalization, including professional development.

Digitalization of higher education in the Caribbean was explored as part of the paper *Accelerating the Future into the Present: Re-imagining Higher Education in the Caribbean* (Beckles & Richards-Kennedy, 2021). The authors posited that:

> The immediate future will see Caribbean universities upgrading their offering with new digital technologies, robust and integrated business enterprise systems, expanded online and blended teaching, complemented by targeted experiential learning. Universities will also invest in new pedagogical material and approaches that allow for smooth transitions to virtual delivery and online business continuity when necessary. (p. 367)

The authors further argued that:

> This new university model will thus take into account the new possibilities generated by artificial intelligence, blockchain technology and other evolutions of digital technologies, the rapidly changing world of work which requires more knowledge-intense skills than before and also the need to bridge the digital divide so that we leave no one behind. (p. 367)

It is important therefore to understand the concept of digitalization. Matveeva, et al. (2020) defined digitalization as a concept "associated with the large-scale penetration of information and communication technologies into the everyday life of modern society" (p. 78). According to these authors, digitalization must be seen as modernization, reformation and transformation of education to include problem-solving and decision-making with the assistance of digital technologies. The aim is to increase efficiency, agility and accessibility.

Digitalization of Higher Education

Digitalization of higher education has been explored from several perspectives: students (Brink et al., 2020; Thoring et al., 2017; Ugur 2020); students assessment (Frolova & Rogash, 2021); instructors, (Ugur, 2020); professional development of instructors (Matveeva et al., 2020); impact of digitization in HE (Shrivastava & Shrivastava, 2022); digital resources and transformation in HE (Benavides et al., 2020; Frolova & Rogash, 2021;); and tertiary institution operations (Telukdarie & Munsamy, 2019).

Within the Caribbean context Bleeker and Crowder (2022) in their study on *Selected online learning experiences in the Caribbean during COVID-19* focused on the responses of 16 Caribbean countries during the Covid-19 Pandemic. Using a combination of interviews and document analysis the researcher conducted case studies on the availability of ICT for online learning and the supporting connectivity across the countries/islands. Attention was placed on the 2020 Sustainable Development Report of which Transformation 6: "develop and use online education tools" (p. 11) was one area of focus. Additionally, the report highlighted online educational tools as critically important to facilitate the expansion of access to quality education. The report also emphasized further investment in digital skills. These are very important in an increasingly digitalized world.

The study found that internet connectivity varies across the Caribbean and that there were many areas where the population has limited access. The researchers in their recommendations highlighted the importance of ensuring internet connectivity through expansion and strengthening of infrastructure as important elements for online learning success. The study also called for an expansion of online learning devices. To advance teaching and learning in a digital age the researchers also recommended centralized learning management systems or "content page with list of approved content for educators" and students (Bleeker & Crowder, 2022. p. 56). This of course would be dependent on the size of the institution. Content pages would only be used where there is no established learning management system. Another recommendation coming from the study is that of consideration for mixed modalities to ensure that the learning of students who experience challenges with connectivity and other issues is not compromised. To this end there is a need to include low and non-technology online learning solutions to supplement in class learning in order to ensure inclusivity across all contexts. As digitalization increases, the call for the engagement of mixed modalities is significant given access limitations across many Caribbean countries. In relation to this study, Bleeker and Crowder (2022) further called for the 'development and revision of ICT policies' (p. 63) having noted that only a few countries have a national digital education strategy that capitalizes on the use of information communication technologies.

Digitalization and the Teaching-Learning Process

Digital learning technologies include learning management systems, multimedia applications, synchronous technologies, collaborative applications (which can either be web or cloud based and allow for interaction between students

and faculty and also student and their peers), cloud-based technologies (which can support storage of resources) and emerging technologies such as artificial intelligence (AI), extended reality (XR), augmented reality (AR), virtual reality (VR), analytics (Martin & Xie, 2022).

Shrivastava and Shrivastava (2022) in their analysis of digital learning environments in India highlighted seven of nine new 'frontline technologies' currently being engaged in teaching and learning. They are cloud computing, Internet of Things (IoT), artificial intelligence, quantum computing, mixed reality, blocked chain, and big data analytics. These technologies offer varying possibilities for teaching and learning.

Rodriguez and Pulido-Montes (2022) in their review of literature on the use and implementation of digital resources during the COVID-19 pandemic at the HE level found that video conferencing, educational videos, and virtual platforms were the key resources engaged by higher education institutions. Most institutions also used free and open access resources.

Thoring et al. (2017) conducted a qualitative pilot study on digitalization from the perspective of students, specifically, the areas of the student life cycle that were digitalized and those areas that needed improvement. The study found that student's expectations of a digitalized experience are pragmatic. They view digitalization as access to course resources in the online space and opportunities for interaction with the institutions' systems, staff and students. The study also reported some challenges with digitalization to include issues with systems being disconnected. This lack of integration challenges the students' expectations for an integrated system to support their learning to include access to resources and library support, administrative and technical needs. The students also expressed challenges with commercial services such as Google, Microsoft, Facebook and Dropbox.

As digitalization increases in teaching and learning there is the need to provide support to ensure both efficiency and effectiveness. These include academic support personnel for libraries and writing centers and student support to include registration, academic advising, study strategy, consultations with others (Martin & Xie, 2022). Other areas of support include technology support specialists for network and technology maintenance and instructional designers to support faculty in course design.

Digitalization of Institutional Administrative Systems and Processes

Digitized administration is considered the most important part of digitalization of higher education (Yureva, et al, 2020). Shrivastava and Shrivastava (2022) defined office automation in higher education as the coordination and control of all administrative functions in 'transparent ways' (p. 8). Major areas for office automation or the digitalization of administrative processes include general administration, finance processes: payroll and financial accounting, managing inventory, administration of student data, managing students and staff records, library services and examination systems. Benefits of office automation include the provision of information/data security, detection of academic misconduct, storage and management of information, cross campus collaboration and other administrative solutions. Listed among the activities involved in office automation are "digitalization of process at source, creating smart forms, creating workflows and document managements, automation of student service request and creating self-service platforms" (Shrivastava & Shrivastava, 2022, p. 8).

Effective plans and strategies and adequate funding are critical to the digitalization process. This provides some context on why some institutions are challenged in the digitalization process given issues with funding and adequate strategic planning. Among the main impact of digitalization on general administration is the use of college websites to display important information about the institution; emails to facilitate intra, inter and external communication, social media tools for groups, such as WhatsApp; the management of admission and registration through online platforms. Other areas of digitalization include course contents, timetable, lectures, results of exams and assessments, etc. Payment of tuition or other fees can be processed online avoiding long queues.

Research indicates that higher education institutions have digitalized their financial operations in many instances allowing for electronic and digital payment of fees and Cloud-based tools are being used to handle financial activities. Institutions are engaging accounting software to facilitate management of payroll functions, capital assets and funding (UNESCO, 2012). There is also a growing need for financial systems to be connected to human resource and student management systems.

Professional Development for Digitalization

Matveeva et al. (2020) defined digital competence as a concept with five components: information literacy, communication and collaboration, digital content creation, security and solution of problems. Digital competence is critical to the advancement of higher education given the affordances of digital technologies, to include the provision of novel opportunities to enhance the quality of teaching, learning, scientific research and organizational management. The researchers are of the view that investment in development of digital skills for both students and staff is highly beneficial for the individual and the organization. For faculty, digital competence is:

> necessary to transform approaches to the organization of the educational process in such a way that the educator has the opportunity to develop those skills that are, on the one hand, relevant for their professional development and, on the other hand, demanded by students (p.85).

Educators' digital competence comprises a number of skills sets that have been grouped to form seven elements (Gudmundsdottir & Hatlevik, 2018): *media literacy* which represents educators' "ability to perceive and creatively rethink academic and professional communications in various media"; *information literacy* which is described as "the ability to find, interpret, evaluate, manage, and share information"; *information and communication technology literacy*, being able to "accept, adapt, and use digital devices, applications, and services"; *communication and cooperation*, educators should be able to use digital networks to support training and research; *digital scholarship*, this digital competence element involves skills having to do with educators involvement in "new academic, professional and research practices" that require the use of digital systems; *learning skills*, which involves educators' ability to learn well using formal and informal technology-rich environments; and *career and management style*, this final element captures skills that allow educators to manage their "digital reputation and identification on the Internet". (p. 79)

Essentially, digital competence is the main ingredient of educators, and institutions of higher learning have to be cognizant of this reality and be willing to support the attainment of this target.

Methodology

In order to investigate the status of digitalization within Caribbean higher education institutions, a small-scale basic qualitative study was conducted among five institutions within the Caribbean. All the institutions are publicly funded and rely primarily on a mix of funding sources including government financing, tuition fees, donations, grants, and partnerships. Data were collected from five respondents, comprising one from each of the five institutions included in the study. The respondents included three faculty members, an e-learning support specialist, and an immediate past deputy principal. The participants were selected because of their expertise and availability. They were interviewed to answer three questions: i) what is the level of digitalization in the institution's systems? ii) what is the status of technology integration in the teaching-learning processes in the institutions? iii) what types of digital infrastructures are in place to support the institutional functions? The interviews were conducted synchronously via the Zoom Platform and were 45 mins to an hour in duration. A semi-structured interview protocol guided the process. Transcriptions were member-checked with the participants to ensure the integrity of the information captured.

Results

Level of Digitalization in the Institution's Systems

The level of digitalization across the Caribbean is not homogenous. The five institutions reviewed are at various levels of digitalization ranging from highly digitalized to minimal digitalization. Only one reported being fully digitalized. One respondent reported that "COVID-19 forced the institution into full digitalization from registration to graduation" (I4). Another reported that "the institution transitioned student processes into a cloud-based model, establishing an online process from application to registration and beyond, allowing the [institution] to adjust quickly to the global COVID-19 pandemic" (I3). However, the respondent from the same institution reported that post COVID-19 the teaching and learning process is back fully face-to-face at the institution.

In **Institution 1** many processes are digitalized but not connected while some are still manual or only partially digitalized. Application is online but processing of applications is manual. Tuition payments are done online but financial

clearance is manual. Registration is online but some processes are manual (e.g., independent study). An Integrative Student Management System (ISAS) is used for managing students' data from registration to graduation, including grade entry and validation. Graduation processing is mostly a manual process. Transcript requests are online, but the processing is manual. The library offers digital services but operates in blended format. Medical services require online registration. Internal and external communication is done via email and telephone but surface mail is also still utilized. Meetings are held using Zoom or Teams. The institution has also begun using an accounting software to facilitate the management of payroll functions and the aim is to link the financial system to human resources management for greater efficiency.

In **Institution 2** the level of digitalization in the institution has allowed flexibility in communication between students and lecturers (advisement, etc.) among members of faculty and staff, and among administrative units/departments. Emails are a common part of communication with each person being assigned a work email. Communication among staff is also facilitated via WhatsApp groups. Students have college emails to facilitate communique from the institution. In addition, the institution utilizes social media (Instagram and Facebook) to send out announcements and reminders to students. The institution is now a cashless environment where all payments are made via card. In terms of admissions individuals are able to apply to the institution online and submit all documents online and students can be tracked electronically throughout their tenure. Grade entry is accommodated electronically and grade verification and ratification are done online using the Academic management system - ISIMS. However, student advising is still manual.

Institution 3 had installed three interactive classrooms complete with (cameras, and speakers) and is able to connect students across the country for virtual sessions. However, across departments the laptops are generally aged. This institution has a number of off campus locations, and the main campus has a library with several computers. Being a teacher education institution some 20 new tablets have been sourced to support teaching practice supervisors in the school of education. The education majors also have a specially assigned technology lab.

Institution 4 has fully digitalized student services from registration to graduation. The selection process is not yet fully digitalized, but notifications are sent out online, and interviews and registration are done online. The Banner Student Information System, developed by Ellucian, a software and services company that specializes in solutions for higher education is used to manage student information and operations. It captures the list and description of courses, pre-requisites, class times and offerings, professors, and classrooms. Student orientation is hybrid, but student advising is done fully online. The library has digital resources, and a media research center is presently being planned. Users at this institution enjoy using tech tools to facilitate communication and prefer this to face to face. Devices are available for daily rental for students who have challenges accessing digital resources to participate in class.

In **Institution 5** most processes are now online including students' life cycle processes. Registration for most programs, transcript processing and all payments are online. Graduation ceremony is streamed online however, the registration process for graduation changes drastically and frequently and this creates complications for stakeholders, especially for administrators. Zoom or other web conference tools are used to facilitate meetings.

The Situation of Technology Integration in the Teaching-Learning Processes in the Institutions

In terms of the number of online courses, 100% of all modules are either online or have an online component. **Institution 1** had heavily relied on the Moodle Learning Management System (LMS) to support lesson delivery. The official web conferencing tool used in the institution is Zoom, however, lecturers also used Google Classroom, Google Hangouts and Teams.

At **Institution 2** the number of online modules varies because instructors have the flexibility of determining which sessions go online. The current status is predominantly traditional, with movement towards blended. This institution utilizes tools such as Web Ex, ISIMS and OpenSis to support technology integration.

At **institution 3** Moodle is the official Learning Management System that is being used but instructors use other applications as well. The Moodle LMS, whether engaged by teachers or not, serves as the platform for all courses and supports web assisted learning where all course material and assignments are accessible. For online conferencing Microsoft Teams, or Google Classroom is used by instructors. However, Zoom is the official web conferencing tool for the institution. Several instructional modalities are employed at this institution: complete online, face-to-face, blended - courses may have one section face-to-face, and the other online. Lecturers employ Interactive PowerPoint presentations, instructional videos - YouTube in their face-to-face classes. It is interesting to note that in this institution not everyone is allowed to teach

online. Instructors must undergo training in order to do so and courses have to be approved by the Academic Affairs Office and the Academic Senate, to be online.

At **institution 4** all courses have an online component. All theory classes are fully online. Some practical sessions are also online, nursing students for example, do their demonstrations online. This institution also reported that grades are accessible fully online, complete electronic application and responses are dispatched electronically, no paper. Payments are all done via electronic fund transfer (EFT) whether part time or full time. The institution uses Cloud Suite as its main platform. In terms of student assessment, the institution engaged Safe Exam Browser as the main tool.

At **Institution 5** prior to the pandemic, teaching and learning was offered both face-to-face and in a blended mode. During the pandemic emergency remote teaching was engaged however post the pandemic the institution has returned to face-to-face. Online and blended learning are still optional but there is now greater buy-in from faculty to deliver online than before. Additionally, post the pandemic and the current financial reality, the institution has added pressure on lecturers to convert programmes/courses online and or blended to remain competitive. Faculty members are using Zoom or other web conferencing tools to engage their students. Because of the poor internet connection there are problems with sessions that require video conferencing. However, from a teaching perspective the increased use of technology is welcomed. Web conferencing software helps relieve class size challenges and the increased access for students who are working is a benefit.

Some faculty are interested in AI and 3D integration but are limited by both their personal competence and the institution's infrastructure. Training and certification were offered in augmented reality, but no progress has been made as there is no or only little infrastructure or support system in place to ensure implementation after the training. A major hindrance for digitalization of teaching and learning is the lack of support for the learning management system. While members of faculty are desirous of using the technology, they do not pursue it due to lack of support.

In terms of managing and monitoring the integration of technology in the teaching and learning process, **all institutions** in the study reported having either a systems administrator or a designated unit to address technology integration.

All institutions identified a number of opportunities which have opened up with digitalization. These include increased access to students living outside of the country who would otherwise have to travel to another country, greater opportunities to increase student numbers, opportunities to improve services (student queries and requests). Further digitalization improves communication, provides opportunities for research, collaboration and sharing of resources across institutions, enables the introduction of new methodologies, provides opportunities for exploring and using technologies to improve the teaching and learning process, track students' progress and for record keeping.

On the negative side, the participants identified substandard equipment that are slow, and aging, inadequate technical support, the absence of computer labs, students not having their own personal computers, bandwidth problems, internet connection challenges - unstable, weak - that interfere with classes, inadequate levels of technology infrastructure and its management as challenges to digitalization.

Types of Digital Infrastructures in Place to Support the Institutional Functions

Looking more specifically at the digital infrastructure it appears that a variety of student management platforms, learning management systems and administrative management systems are used throughout. These include MOODLE, ISAS, ISIMS, Banner Student Information Management System, Colleague, a data management software and PeopleSoft, a human management system.

All except one institution identified internet connectivity and issues with broadband as a problem. Just one institution had upgraded their infrastructure and bandwidth is good. Building into the fee system a provision for IT resources helps enhance the purchase and use of new technologies. In some institutions students and staff experience problems with consistent access to Wi-Fi.

In most of the institutions, library services are digitized. Resources include CALCAT Library system, Online access to eBooks, eJournals and database management systems, such as EBSCOHost, ProQuest for dissertations and thesis, eChat with librarian, digital access to Collections which are arranged according to faculties and access to Turnitin.

Discussion

Like in other countries, COVID-19 has played a major role in pushing Higher Education institutions within the Caribbean to become more digitalized in their systems and processes both for teaching and learning and for administrative

functions. Our study shows that Caribbean higher education institutions are upgrading their offering with new digital technologies, they have been improving their business enterprise systems, and expanded their online and blended teaching. However, institutions continue to struggle with less than adequate infrastructure to enable a smooth transition and fulsome integration of technology.

Advanced Digitalization of Communication Processes

Much progress has been made among Caribbean higher education institutions in the digitalization of communication processes. Flexibility in communication has been greatly improved with most institutions making use of various technologies and social media platforms including emails, WhatsApp, Instagram, Facebook, Zoom and Teams to communicate among members of faculty, staff, various administrative units, students and other stakeholders within and outside the institutions.

Major Progress in the Digitalization of Financial Operations of the Institutions

Most institutions included in this study have become cashless in their financial operations. In this regard their financial operations have been digitalized enabling the electronic payment of fees for various kinds of services including application fees, tuition fees.

Continuous Improvement in Student Life Cycle Processes Through Digitalization

The student lifecycle processes are either fully or partially online from application to registration, orientation, student advisement, grade entry and validation to graduation. Among the technology tools utilized are Integrated Student Administration System (ISAS) and ITech Student Information Management System (ISIMS).

Digitalization of the Teaching and Learning Process

In terms of technology use in the teaching and learning process the institutions in this study are well advanced but to varying degrees. Institutions employ a variety of instructional modalities: face-to-face, blended and fully online. The most popular Learning Management System employed among the institutions is MOODLE. Among the web conferencing tools used for the delivery of lessons in these institutions are Zoom, the most used, Google Hangout, Teams, and Blackboard Collaborate. In keeping with students' expectations, institutions are quite advanced in making courses available online and expanding opportunity for students' interaction with the institutions' systems, staff and other students.

Varying levels of Technological Infrastructure

Supporting infrastructure varies across institutions, however, they are employing a variety of student data management platforms, learning management systems and administrative management systems to facilitate the various academic and administrative management processes within their institutions. A vital dimension of technology infrastructure is access to Wi-Fi; however, institutions continue to experience challenges in terms of internet stability which interferes with the smooth transition to fully online course offerings and full digitalization. Additionally, a critical enabling factor for technology integration is the availability of technical support to assist users. In this study all the institutions reported having relevant personnel in place, either individuals or whole units depending on the size of the institution.

Implications and Conclusion

The study shows that while higher education institutions in the Caribbean are moving forward with the business of digitalization there are a number of realities that impede the process. Among these are the institutions' reliance on external internet providers resulting in choppy and unstable supply; and cost related to infrastructure development and technology acquisition. Digitalization of education systems can be expensive, and funding is one of three critical elements for successful digitalization, the other two being plans and strategies. This issue of funding can explain why digitalization is not fulsome across the board. Therefore, one recommendation for addressing this challenge may be for institutions to partner with private sector organizations to build out the technological infrastructure. Additionally, as was done by one of the institutions in this study, consideration may be given to building into students fees a sum dedicated to the provision of technology resources.

Our study suggests that Caribbean higher education institutions still have some ways to go before they can integrate the new possibilities generated by emerging technologies such as artificial intelligence, blockchain technology, augmented

and virtual reality and other evolutions of digital technologies. Nevertheless, they continue to modernize and transform towards building robust and integrated systems within their institutions.

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