



## Case Study

# A University College Working in the Midst of the War in Sudan Through Digital Education

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**Abstract:** The war in Sudan started on April 15, 2023 and has already caused the displacement of more than 14 million persons and the destruction or relocation of more than 120 higher education institutions. This article describes the experience of a university College in that country that had to carry out a forced digital transition to make the continuity of its academic activities possible in the midst of a civil war. The study presents the process Comboni College of Science and Technology followed to resume activities starting from the assessment of the feasibility of the operation with challenges such as the connectivity of students and lecturers to the internet, the financial limitations to pay academic fees, limited digital skills, psychological stress, the lack of a safe home and the mobility provoked by the involvement of the conflict. In a second moment, the study assesses the satisfaction of the students with the learning experience and compares the results with those of a previous online period of study of the same institution during the COVID-19 pandemic. In spite of the limitations of the context and the fact that the students prefer the face-to-face learning experience to the online one, they express their satisfaction with the decision to continue studies via the Learning Management System as this way will allow them to complete their degree in the midst of the war. The study also reveals the importance of virtual tutoring to bridge the lack of digital skills and support the students in a very adverse context.

**Keywords:** e-learning, Sudan, higher education, war, displacement, digital transition

## 1. Introduction

The world has been stricken in the last years by the conflicts in Ukraine and Gaza. Their impact on higher education institutions and academic communities of both countries has been studied by different scholars and the bibliography is quite abundant (Jebri, 2024; Kurapov et al., 2024). But the biggest humanitarian crisis in the world is taking place in Sudan and the literature on its impact on higher education is rather scarce. This paper describes the process a university college in this country followed to assess the possibility of working in the midst of a civil war and the steps taken to resume academic activities. Secondly, the research evaluates the satisfaction of the students with the learning experience in such a particular and challenging context.

For this purpose the research analyses the data from an initial feasibility assessment carried out between June and August 2023, the successive online registration forms filled by the students in two successive periods in the middle of the armed conflict and a specific survey to assess their learning experience in October 2024, ten months after having resumed the academic activities interrupted by the war that broke out on April 15, 2023.

Comboni college of science and technology (CCST) is a higher education institution created as the development of a high school established in Khartoum in 1929 by the Comboni Missionaries. It was located in the city center of Khartoum along the main road leading to the Presidential Palace. The area became a battlefield from the first day of the war and was not accessible anymore since then.

## **2. The analysis previous to the educational intervention**

In 2019 the College had been surrounded by thousands of demonstrators during the Popular Revolution that led to the end of the 30 year regime of Omar Al-Bashir. Public universities were closed but private institutions were allowed to resume in January of that year if they could. In spite of that tense context, through social media first, as the College was closed like the others for some days, some students asked the administration to give continuity to academic activities and, secondly face-to-face in meetings between students and the Principal once the Ministry of Higher Educational allowed universities to resume. Similarly, during the COVID pandemic, the College did not stop working (Naranjo Alcaide & Greco, 2023).

But this time the challenge was tougher. Before taking any decision, it was necessary to assess the wishes of the students, their real possibilities to re-engage in academic activities, the availability of qualified teaching staff able to teach online and the technical and financial feasibility of the operation. Two months after the beginning of the conflict, between June 17 and August 12, 2023, a first survey was prepared with Google Forms and distributed among the students through the official channels of the College in the social media, WhatsApp groups and e-mail addresses to ask them whether they wanted to continue their studies or if they preferred to wait for better times. The information collected through this survey was the foundation to design the educational intervention.

By educational intervention, it is understood here an action, which differs from ordinary existing teaching practice, taken to support students with particular challenges or difficulties. In this case, the disruptive event that completely changed the learning environment of the students and lecturers was the break out of a civil war and the educational intervention consisted of the adaptation of the teaching methodology to make the resumption of academic activities possible.

### **2.1 The context of the educational intervention**

Sudan had started a process of transition to a democratic civilian rule in 2019 that was abruptly interrupted by the break out of a war between the Sudan Armed Forces (SAF) and the Rapid Support Forces (RSF). While other conflicts during the second half of the XX century and the beginning of the XXI century took place in the peripheral regions of Sudan, this last one spread all over from the capital, where most higher education institutions were located, to the rest of the country.

The ongoing conflict has displaced over 14 million persons which represents around 30% of the population (IOM, 2024) and destroyed fundamental infrastructures and tangible cultural heritage. The war has caused the flight of qualified human capital, including university lecturers and researchers, the enlistment of young university students in the competing armies (Badawi Bashir, 2024), as they are faced with the impossibility of continuing their academic career or finding a job (UNESCO, 2024), the destruction or closing of schools and universities or their transformation into shelters for displaced persons. Moreover, most university students leave their homes without the necessary documents to continue their studies abroad while the new university they may try to enrol in will ask for their transcript certificates authenticated by the Ministry of Higher Education and Ministry of Foreign Affairs.

In September 2023, just five months after the beginning of the war, 6.5 million children who had been enrolled in Sudanese schools abandoned their education and more than 10,400 schools (54% of the total of 19,302) were directly affected by the conflict and forcibly closed in the last two months of the school year before the summer break (UNICEF, 2023). These numbers should be added to the 7 million of children who had dropped out of the educational system before the war (Elkamel & Maalla, 2024). University students in government universities had also faced long periods of inactivity during the 2019 Revolution and the COVID pandemic in 2020 (Eltayib & Suliman, 2020) before the ongoing war.

The Ministry of Higher Education and Scientific Research (MOHE) noted in August 2023 that 104 government and

private higher education and research centers were affected by the war and were totally or partially damaged or looted (Abbas, 2024). With the extension of the conflict, the number of higher education institutions located in conflict areas (Khartoum State, Kordofan, Darfur, Jazira) without capacity to operate in their original sites due to the battles reached 135 out of the 157 officially recognized by the Ministry. These government and private colleges and universities hosted around 87% of the students in the country if we take the last open statistics of the admission office of the Ministry in 2021/2022 (MOHE, 2024).

Such a context presents some similarities with the Ukrainian one where universities ruined or occupied universities by the Russians had to relocate and shift to remote learning (Chala et al., 2023). War conflicts generate a vicious circle that links the suspension of academic activities with the enlistment in armies which contributes to their stagnation. Breaking this circle is not easy since the battles lead to the destruction of telecommunications and power supply infrastructures and the displacement of populations. In fact, few universities in Sudan were trying to fast-track the graduation of students who were struggling to finish their courses before the war began (Sawahel, 2024).

## 2.2 Willing to resume in spite of the war?

Among 768 students registered in the College before the war, 256 responded to the first questionnaire. 176 students expressed their desire to continue studying despite the situation in the country (68.7%) and 78 (30.5%) responded negatively to the question of the first questionnaire: “If the College resumes the second semester on August 7, 2023, would you be ready to join the study through an online learning management system?” (See Table 1).

**Table 1.** Willingness to resume studies (first questionnaire)

Program	Registered students before the war	Responses during 17/6-12/8		Readiness	
	No.	Tot	%	Yes	No
bachelor of arts (BA) in Educational and Christian Religious Studies	28	6	21.4	6	0
BA in English Language and Literature (EN)	173	40	23.1	30	10
bachelor of science (BSc) in computer science (CS)	80	31	38.7	21	9
BSc in information technology (IT)	114	49	43	31	19
BSc in nursing sciences (NU)	152	60	39.5	33	27
Diploma in IT accounting (ITA)	106	31	29.2	26	3
Diploma in IT management (ITM)	115	39	33.9	29	10
Total	768	256	33.3%	176	78

Therefore, one-third of the total number of students registered before the war was reached (256) and answered this first questionnaire. 254 expressed their opinion. In spite of the complex situation, 69.3% of them expressed the wish to resume academic activities. This percentage is relevant as students could have felt that the university intended to open a new semester to meet its own financial needs as perceived by some students in Gaza (Jebril, 2024).

## 2.3 Is it feasible in the midst of a war?

The decision on the resumption of academic activities needed a careful analysis of the critical situation of the country, students and teaching staff. It can also be probably deduced that non-responding students were not ready to

resume academic activities.

The first question mark had to do with access to the internet since the learning environment was supposed to be the learning management system (LMS) of the College, Moodle. This Modular Object-Oriented Dynamic Learning Environment (Moodle) is based upon a constructivist educational approach (Crosslin, 2009), while the Sudanese educational system is based upon memorization, and was introduced in the College in 2020 in the context of the COVID-19 (Naranjo Alcaide & Molineri, 2021).

According to the company Cable specialized in comparing real broadband width, Sudan occupies the position 223 out of 229 in 2024 concerning mean download speed (4.02 Mbps). This means that to download a 5 GB file a person needs 2 hours and 49 minutes (Cable, 2024). The war has damaged the telecommunications infrastructure. Consequently, the median mobile internet connection speed decreased by 5.68 Mbps (-42.5 percent) during 2023 (Kemp, 2024). Instead, fixed internet connection speeds increased by 2.56 Mbps (+50.7 percent) during the same period.

34.1% of the respondents at the time of the first survey stated that they had good access. Only 14.3% had a connectivity considered “very good”. 27.5% had limited access and 21.2% could only see messages via WhatsApp. Obviously, those with better connectivity were more eager to start their studies (See Table 2).

**Table 2.** Wish to resume in relation to access to the internet (first questionnaire)

Readiness	Connectivity-Access to the internet					Total
	Very bad	Limited	Good	Very good	NA	
No	37	28	6	4		75
Yes	20	40	80	33	1	174
Total	57	68	86	37	1	249

## 2.4 The financial challenge, the access to the electricity and the ownership of a device

Some students set out into the unknown with only little money in their pockets. 45.3% of students said that they were unable to pay their academic fees. And it is among those who cannot pay where we find the highest percentage of students who declare not to be ready to continue (79.5%) (See Table 3).

**Table 3.** Financial capacity in relation to readiness to resume studies (first questionnaire)

Readiness	Capacity to pay the academic fees				Total
	I cannot pay	I can, but gradually	I can pay	NA	
No	62	11	2	3	78
Yes	53	62	58	3	176
Total	115	73	60	6	254

Sometimes the access to the internet and the financial challenge are linked as the connection to the internet either through mobile data or the Starlink satellite that the two armies control demands a financial capacity which is too demanding for some. Some students have continued their education from cities under the control of the regular army (SAF) but are besieged by the militias (RSF) with continuous bombings like El Obeid or Al-Fasher.

It is also necessary to consider the tool necessary for the continuity of studies in online mode, that is, whether or not they have a personal laptop, an iPad or a smartphone. Only 103 (40.7%) respondents declared to have a laptop when answering the first questionnaire (See Table 4). And it is precisely those with a laptop who express themselves readier to continue their studies. 212 students instead had a Smart Phone.

**Table 4.** Ownership of a laptop in relation to readiness to resume studies (first questionnaire)

Readiness	No	Yes	NA	Total
No	65	13		78
Yes	83	90	2	175
Total	148	103	2	253

We can compare these data with those of the students who actually registered in November 2023 for the second semester of the 2022-2023 academic year and with the data of those who registered between June and July 2024 for the 2023-2024 academic year (See Table 5).

**Table 5.** Time evolution of the ownership of a laptop

Laptop	Students responded to the questionnaires from (dates)					
	17/6/2023 to 12/8/2023		11/2023 to 1/2024		6/2024 to 8/2024	
Yes	103	41%	81	42.9%	34	30.9%
No	148	59%	108	57.1%	76	69%

It should be noted that from June to August 2024, 74 nursing students were registered and that the percentage of laptops owned by them is much lower than the one of students registered in technology-oriented programs. Moreover, some students had to sell their laptops for financial problems or were stolen and lost with the progress of the conflict and their successive movements from one location to another. This situation forces most students to work with a smartphone.

Thus, the educational intervention implied the accelerated digital transition from an in-person learning environment to a digital one mainly accessed through smartphones.

Another challenge that students have encountered is access to electricity. This problem became more acute with the passing of time and an increasing amount of infrastructure that generated electricity that has been destroyed. Power stations and electrical installations have been the object of looting and continuous drone attacks by the Rapid Support Forces (Kiennemann, 2025).

## 2.5 The mobility of students

The College also collects data of the location of the students in every survey or registration period. At the time of distribution of the first questionnaire, only 19.4% of the students remained in Khartoum State, where the College was located, and 64.9.1% were still in Sudan. 24.6% of the students, usually those of South Sudanese nationality, had sought refuge in the country of their ancestors. A gradual increase in the percentage of students in Cairo is also seen with the passing of time (See Table 6).

**Table 6.** Students' location with the progress of the conflict

Students' nationalities before the war	Students' Location		From 17/6/2023 to 12/8/2023		From 11/2023 to 1/2024		From 6/2024 to 8/2024	
	Country	State	No.	%	No.	%	No.	%
58.2%	Sudan	Khartoum State	48	19.4	15	7.7	18	15.3
		Jazira State	24	9.7	16	8.2	4	3.4
		Sennar	3	1.2	4	2.0	3	2.5
		Red Sea	7	2.8	12	6.1	11	9.3
		Gedarif	6	2.4	10	5.1	8	6.8
		Kassala	7	2.8	6	3.1	5	4.2
		White Nile	17	6.9	10	5.1	4	3.4
		Northern	5	2.0	8	4.1	7	5.9
		Nile River	4	1.6	4	2.0	4	3.4
		North Kordofan	4	1.6	4	2.0	2	1.7
		South Kordofan	3	1.2	3	1.5	4	3.4
		Blue Nile	3	1.2	1	0.5	0	0.0
		Other	1	12.1	2	1.0	2	1.7
		Total	161	64.9	95	48.5	71	60.2
27.34%	South Sudan	Juba	31	12.5	57	29.1	15	12.7
		Other locations	30	12.1	11	5.6	8	6.8
		Total	61	24.6	68	34.7	23	19.5
0%	Egypt	Great Cairo	16	6.5	18	9.2	15	12.7
14.45% <sup>2</sup>	Ethiopia		6	2.4	3	1.5	1	0.8
0%	Uganda	Kampala	4	1.6	8	4.1	2	1.7
		Other			4	2.0	7	0.8
768 <sup>3</sup>	Total		248		196		118	

<sup>2</sup>This percentage refers to Ethiopian and Eritrean students together. No one of the latter ones went back to Eritrea

<sup>3</sup>This was the total number of students before the war. The percentages of the column refer to that total number

These statistics also reveal a movement of South Sudanese students from their first refuge in their ancestors' country towards the capital, Juba, where there is better access to the internet, between the first and second periods. It should be mentioned that Juba was also one of the locations of the final exams for the 2022-2023 academic year in April 2024.

As for the last period, it is worth mentioning the impact of the registration of 74 nursing students, a program where 68 students are Sudanese (91.9%). Although between June and August 2024 there was 15.3% of registered students still in Khartoum State, most of them ended up in the areas controlled by the regular army (SAF): that is, in the Eastern states (Red Sea, Kassala and Gedarif, where 20.3% of registered students took refuge) and in the North (Northern and

Nile River, 9.3%) (See Table 6).

In addition to the challenge caused by the physical mobility, we have to consider the more difficult to quantify related to psychological trauma.

### 3. The educational intervention

After analyzing the data from the first questionnaire, the different heads of Department began to distribute the courses among the lecturers who had the capacity to teach online. Some of them had already taught online for a period of three months during the COVID pandemic (Naranjo Alcaide & Molineri, 2021; Naranjo Alcaide & Greco, 2023) and had had online training programs through two projects carried out by the College with institutes of the National Research Council of Italy, “Innovation in society: training paths and valorization of human capital in Sudan” (INSO) (Naranjo et al., 2023) and “A new Sudan through culture, technology and innovation”, SudanInnovation (Naranjo Alcaide & Greco, 2023). Moreover, a group of 20 lecturers experienced the perspective of the online students during a course of English language with the Universidad Internacional de La Rioja (UNIR).

When everything was almost ready to start, on August 13, 2023, after a meeting of the Council of Ministers, the Minister of Higher Education and Scientific Research of Sudan decreed the suspension of academic activities in all Sudanese universities (Osman, 2023). The decision meant leaving hundreds of university lecturers without work and thousands of students without studies. The decree was temporary until mid-October, but at the time it was not known if such suspension would last for the entire duration of the war. Fortunately, on October 7, the Council of Ministers authorized the reopening of academic activities starting from October 15, 2023 (Sawahel, 2023).

#### 3.1 Reactivating the learning management system

The College immediately reorganized itself to re-open the registration of students while organizing webinars to refresh the familiarity of lecturers with the learning management system (LMS) and to introduce those who had never used it. The College had already hosted Moodle, an open source LMS, in its website during the COVID pandemic. After that period, lecturers were invited to upload there every course description, even if classes were running face-to-face after the pandemic.

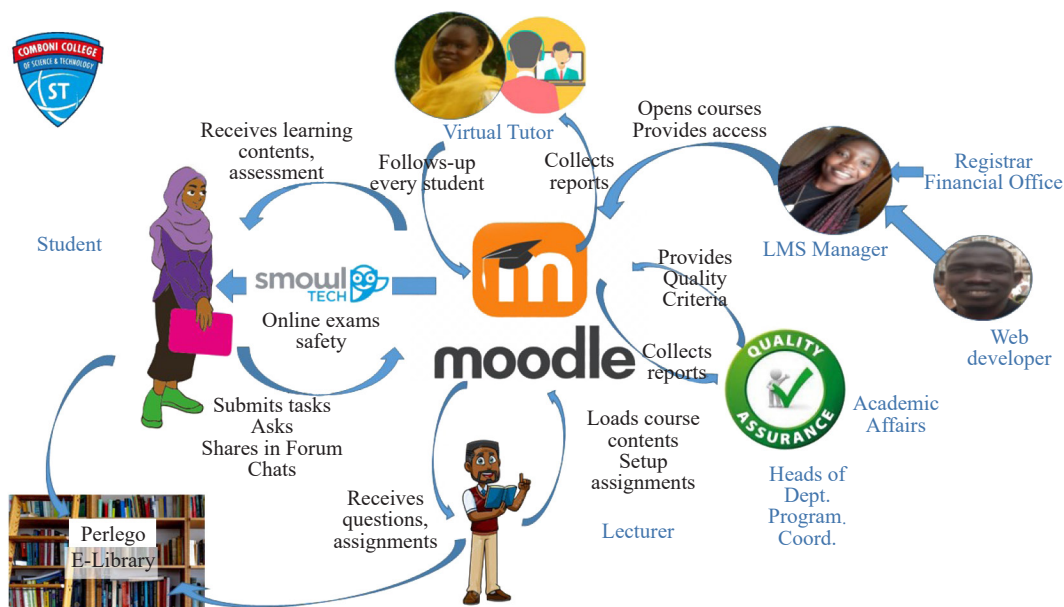


Figure 1. CCST online learning environment

Considering the limitations of connectivity, the training introduced the lecturers to use asynchronous tools of Moodle (uploading learning materials, forum, chat rooms, etc.) and to upload recorded video-lessons on YouTube or Drive so that after that, the link could remain available for the students.

In July the College upgraded the Moodle version to 4.4, which allows the students to download the learning materials in the smartphones when they have connectivity and continue working offline. The IT team of the College also added the plug-ins of an application for videoconference, Jitsi, and of a proctoring company, SMOWL, to ensure the safety of online exams. There is also a technical team of lecturers from different departments who format the exams prepared in Microsoft Word by the different lecturers and upload them on Moodle.

For the 2023-2024 academic year, a virtual tutor has been added to accompany the students' academic path and support them along with the licence to have access to an e-library, Perlego. In this way the following learning environment has been developed (See Figure 1).

### ***3.2 A simple physical structure***

The College premises in Khartoum have not been accessible since the beginning of the conflict. Therefore, the College opened an office in Port Sudan, inside Comboni Secondary School, and applied to the telecommunications company Sudatel to install fiber optics there. Initially, the office hosted the LMS manager and the Principal. The web developer, a College graduate, settled in Juba (South Sudan) and worked from there.

Thanks to the balance of a project funded by the Italian Agency for Development Cooperation (AICS) in collaboration with the Italian Non-Governmental Organization (NGO) specialized in the health field, Associazione Italiana di Solidarietà con i Popoli (AISPO), the College planned to rent new offices in the city of Wad Medani, 194 km. south-east of Khartoum, where the biggest number of students and lecturers had taken refuge in November 2023, especially those related to the nursing program. The new project included three fields of action: a CCST office where lecturers could prepare their online lessons and students could have a point of reference and access to the internet; a clinic specialized in palliative care and managed by the nursing department; and the headquarters of the Comboni group of volunteers in palliative care. The war worsened the conditions and the difficulty of access to medical centers for thousands of people suffering from chronic or terminal illnesses in their homes. The Wad Medani site was supposed to be the base training volunteers to provide this service of support to the families with persons in the above described conditions.

But on December 15, 2023 the rapid support forces (RSF) attacked the town. Thousands of people were on the move again. Given the impossibility of operating in Wad Medani, the College and AISPO proposed AICS to have the staff of the nursing department moved to Port Sudan to implement the project from there. In this way, the office in the capital of Red Sea State hosted some more staff members: the Learning Management System manager, an Assistant to Academic Affairs, a Secretary, an officer in charge of certificates and testimonies and the members of the nursing department while 27 lecturers continued teaching online from different locations in Sudan and 21 from abroad (See Figure 1). With the passing of time the office was equipped with solar energy and solar air conditioners to face the lack of electricity and the extreme temperatures of Port Sudan.

On April 20, 2024, CCST began its final exam session for the academic year 2022-2023 which had been interrupted by the war. Students could choose between three physical locations-the Catholic University of South Sudan in Juba, Holy Family School in Helwan (Egypt), and Comboni Secondary School in Port Sudan-or take the exams online. The IT team developed a protocol for the exams to be administered via the Learning Management System using mobile phones. For the 2023-2024 academic year, physical exam sessions were dropped and an agreement with a proctoring company was signed to ensure the safety of online exams.

### ***3.3 Integrating online theoretical learning and clinical practice***

While students in programs like computer science can carry out their practical training online, programs such as the BSc in Nursing require in-person clinical practice. This problem has had a terrible impact on academic health programs across the country (Iesa, 2024). The project with AISPO allowed the College to rent apartments in Port Sudan and establish agreements with the Ministry of Health and Social Development of Red Sea State and health centers for the practical training of the students. On May 5, 2024, the College welcomed 23 first year students of the Bachelor of Nursing program who were supposed to complete the clinical practical of the second semester. The students arrived



from their places of refuge after leaving their homes in Khartoum State: El Obeid, Wad Medani, Kasala, Meroe, Dongola and Gedarif. Only one student lived in Port Sudan. The College took advantage of the presence of these students in Port Sudan to develop their skills to use the digital platform (Moodle) with Smart Phones.

From October 26 to December 21, 2024 the College hosted a second group of 74 students who completed the clinical practice of the second (17 students) and the third semester (57 students).

### **3.4 At the service of the community**

The coordinator of the BSc in Nursing Sciences and the head of the Nursing department specialise in palliative care, an academic field that is virtually non-existent in Sudan and where the College is a pioneer (Damanhuri & Marhoom, 2021). Thanks to the above mentioned funding from the Italian Agency for Development Cooperation (AICS) and the collaboration with AISPO, the College opened the first clinic entirely run by nurses and registered under the name of a nurse in Sudan. It is a hospice that coordinates the accompaniment of persons with terminal and chronic illnesses in the community by multidisciplinary teams made of College staff and local volunteers.

The College has already trained 237 volunteers who work with the nursing staff in this service. This activity links the College with the community which is transformed through mercy towards the weakest. Nursing students are also involved in this activity when they are in Port Sudan as part of their education to serve the community. The intertwine of digital and community activities is also expressed through the development, this time with the support of the German company Secutrial, of a browser-based electronic data capture system for collecting patients' data in order to improve the service and carry out research.

## **4. Research project and methodology**

### **4.1 Research objectives**

Once academic activities were resumed in a completely new different setting for both students and teaching staff, this research aims to evaluate the learning experience and identify orientations to improve it. The first objective has a descriptive character while the second one is exploratory; therefore, the research can be given both a descriptive and an exploratory character.

The research also deals with these specific objectives or sub-questions:

- (a) Has the students' level of English had an impact on their capacity to use the LMS?
- (b) In which way scarce previous digital skills limit the capacity of the students to study through the LMS?
- (c) Which challenges among the following ones represent a bigger obstacle for the students: financial limitations, access to the internet, lack of laptop, mobility, time management, the complexity of the Learning Management System, psychological stress?

Given the research objectives, the fact that there is no control over behavioural events and that the questions focus on contemporary events, the most convenient research tool is the questionnaire (Yin, 2014).

### **4.2 Research strategy and tools**

The first questionnaire was designed in view of exploring the situation of the students and assessing the feasibility of resuming the second semester of the 2022-2023 academic year that had been interrupted by the breakout of the war. It took place between June 17 and August 12, 2023.

The second questionnaire was distributed from November 2023 to January 2024 and combined some questions related to their registration with some related to the assessment of their situation. This information was shared with the teaching staff so that they could adapt their teaching to the concrete situation of the students.

The third questionnaire was distributed from June to August 2024 in view of registration for a new semesters.

The fourth one instead was a specific survey designed to respond to the research questions of this study and was distributed among the registered students between October 1 and October 26, 2024. It will be called "quality assessment" in the rest of the article to distinguish it from the other questionnaires. It was structured in five sections. The first one collected the data related to the academic program and year of the student along with the nationality (3

questions). The second section dealt with their level of English language (3 questions). The third section collected data on their digital skills, habits and attitude (questions 8 to 26). Questions 27 to 34 dealt with the challenges students face to study in their concrete situations. And questions 35 to 63 assessed their learning experience according to the six dimensions defined by Sun: student, teacher-lecturer, course, technology, system and environment (Sun et al., 2008).

The results of this survey were compared with the assessment of the online learning experience of the same institution carried out in 2020 (Naranjo Alcaide & Molineri, 2021; Naranjo Alcaide & Greco, 2023). The monthly reports of the virtual tutor are also integrated in the assessment. The results are also confronted with studies on universities working in recent war conflicts like Gaza (Jebril, 2024) and Ukraine (Chala et al., 2023; Kurapov et al., 2024).

All the four questionnaires were prepared on Google Forms and distributed to the students through e-mail and WhatsApp.

### 4.3 Students' population

The number of registered students before the war was 768 (See Table 1). At the time of the last survey in view of assessing the learning experience, this number had diminished to only 137 where 74 study the Bachelor in Nursing Sciences (NU). These ones were the most active in the questionnaire (See Table 7).

**Table 7.** Number of respondents and registered students (quality assessment)

	CS	EN	ITM	ITA	IT	NU	Total
No. of respondents	3	1	0	1	4	66	75
Total No. of students	18	17	3	6	19	74	137
%	16.67	5.88	0.00	16.67	21.05	89.19	54.74

All these students who filled the questionnaire were in Khartoum State before the war in March 2023. Some months after the beginning of the war many of them left Khartoum State (See Tables 6 and 8). Al-Jazira State, whose capital is Wad Medani, 194 km South East of Khartoum became the main place of refuge in November 2023. That city was attacked by Rapid Support Forces around December 15, 2023, which caused a new displacement of people. On June 29, 2024 the rapid support forces (RSF) also attacked Sinja in Sennar State, where some students had also taken refuge (Sudan War Monitor, 2024).

**Table 8.** Displacement of responding students

Region	State	November 2023	March 2024	October 2024
Eastern region	Gedarif	1	3	6
	Kasala	1	6	6
	Red Sea State	3	12	15
Central Region	Khartoum State	18	12	10
	Al-Jazira	17	5	0
Northern Region	Nile River		1	0
	Northern State	4	5	10

**Table 8.** (cont.)

Region	State	November 2023	March 2024	October 2024
Western Region	Northern Darfur		1	1
	South Darfur	2	2	
	North Kordofan	1	1	
	South Kordofan	2		1
Southern Region	Sennar	5	3	0
	White Nile	9	6	2
Total	Sudan	63	57	51
	Egypt	2	4	12
	South Sudan	4	6	4
	Uganda		1	1
	Grand Total	69	68	68

Table 8 shows a gradual movement of the students towards the areas under the control of the Sudan Armed Forces (SAF) in the East (Gedarf, Kasala and Red Sea State) and the North (Northern State) of the country and Egypt.

#### **4.4 Ethical considerations**

The preparation and distribution of the questionnaire were animated by the two principles of Goodhand (2000) for researching in a war area: doing no harm and doing some good. In this framework, the surveys distributed through “Google Forms” included a consent statement. The e-mails of the students are kept confidential and the participation in the last survey to assess the quality of their learning experience was voluntary. Nonetheless, it reached 54% of the total number of registered students. For a sample of 75 respondents from a total population of 137 students, the margin of error at a 95% confidence level is approximately  $\pm 7.64\%$ .

At the same time, it cannot be neglected that the total number of students before the war was 768 (See Table 1) and many of them could not register, probably for not having access to the internet or conducive physical conditions or financial means. Consequently, the research has the big limitation of not reaching students who were registered in the College before the war and did not manage to continue their studies.

## **5. Assessment results**

### **5.1 Student’s linguistic background**

The language of instruction in basic and secondary schools provides an idea about the level of English of the students (See Table 9).

**Table 9.** Linguistic background (quality assessment)

	Language	No.	%
Basic School	Arabic	71	94.67
	English	4	5.23
Secondary School	Arabic	71	94.67
	English	4	5.23

Sudan is an Arabic speaking country. Nonetheless, the students do not consider this a major problem as, when asked to express their agreement with the following sentence from 1 (total disagreement) to 7 (total agreement), “Since my English is very good and contents on the learning management system (LMS) are in English, I did not find any problem related to English when using the LMS”, the average result is 4.04, which answers to the first research question.

## 5.2 Student’s digital skills

Another challenge the students face has to do with their scarce previous digital skills and lack of a laptop to navigate through the internet (second research question) (See Table 10).

**Table 10.** Digital habits and skills before the war and access devices to the internet (quality assessment)

Question	Yes	No	NA
Were you frequently using an e-mail address before the war?	37	31	1
Had you ever sent an attached document by e-mail before the war?	21	54	
Did you frequently use WhatsApp before the war (before April 2023)?	67	8	
Did you frequently use Telegram before the war (before April 2023)?	34	41	
Do you follow the official Facebook page of the College?	69	6	
Did you own a laptop before the war?	16	59	
Do you have a laptop now?	10	65	
Did you have a smartphone before the war?	71	4	
Do you have a smartphone now?	74	1	
Did you have an IPAD before the war?	2	73	
Do you have an IPAD?	1	74	

In 2020 just 67% of the students had a smartphone but 41.63% of them had their own laptop (Naranjo Alcaide & Molineri, 2021, p. 756). Now just 10 out of 75 students own a laptop (13.3%) and 6 of them lost it during the war (See Table 10). Instead, the majority own a smartphone (94.7%) and 3 students who did not have it before the war now they have it (See Table 10). This fact cannot be neglected as working with smartphones and not with laptops conditions the quality of the online learning experience. In general, students without a laptop perform worse than students with a laptop (Reisdorf et al., 2020).

The results show that iPads are not a common device among the students. Just one states to own one (See Table 10).

In 2020 the program of Nursing Sciences was not part of the College and therefore the majority of the students

were registered in technology oriented programs. Then the percentage of students who used the e-mail was 59.11% (Naranjo Alcaide & Molineri, 2021). This percentage is not so different from the one of the College students before the war (53.62%) (See Table 10). The same can be said concerning the experience of sending an attachment to e-mail messages. 38.42% of the students had done it in 2020 and 38.88% in 2023. The use of WhatsApp instead increased from 74.88% to 89.3% (Naranjo Alcaide & Molineri, 2021, p. 757, and Table 10). We have to consider that the respondents are a selected sample of students that includes the most digitally active. In fact, they usually visit the official Facebook Page of the College (92%) (See Table 10).

The self-perception of the students on their digital skills and attitude towards working with a computer was also assessed.

**Table 11.** Students' self-perception on digital skills and working with a computer (quality assessment)

Indicate your level of agreement with this sentence from 1 (total disagreement) to 7 (total agreement)	Average
I feel confident navigating in the internet. Indicate your level of agreement with this sentence	4.71
I feel confident downloading materials from the Internet when I need.	4.81
I feel confident using Internet search engines such as Yahoo, Google...	4.59
I feel confident using a Learning Management System like Moodle because I already experienced it before	4.53
I was already familiar with the computer before the war and therefore I was able to adapt myself to online learning without big problems.	2.96
I believe that working with computers is very easy.	3.60
I believe that working with computers makes me feel psychological stressed.	3.59
I believe that working with computers makes a person more productive at his/her job.	4.85

These results reveal that most students are not familiar with the computer but they feel confident navigating in the internet, downloading materials and using search engines. They also have a positive attitude towards the computer as they believe that it makes you more productive (See Table 11).

### 5.3 Students' financial and housing constraints and time management

The following tables focus on answering the third research question (See Tables 12 to 17). The families of most students lost their job as a consequence of the war. This fact limited their financial resources, obliged them to leave their homes and face the challenge of organizing the time of study in different environments.

**Table 12.** Main challenges to study online (quality assessment)

Indicate your level of agreement with this sentence from 1 (total disagreement) to 7 (total agreement)	Average
My main challenge to continue studying was to pay tuition and registration fees.	5.29
My main challenge to continue studying was to pay the internet.	4.97
My main challenge to continue studying was the fact of being on the move outside my house because of the war without enjoying a comfortable place	5.72
My main challenge to continue studying was the fact of not having a personal room or suitable place to study alone	5.28
I found it difficult to organize my time to study alone.	4.84
Online study allows me to arrange my time more effectively	3.76
I found it easy to organize my time as I had studied some online courses before	3.22

The difficulty to organize the study alone, without the external organization that comes from the daily time-table of classes, appeared in the survey of 2020 (Naranjo Alcaide & Molineri, 2021, p. 759) and appears again in this study (average of 4.84 over 7, Table 12).

### 5.4 Technological challenges: Access to the internet, provision of electricity and device

The war has destroyed many facilities producing electricity and part of the network related to the internet service.

**Table 13.** Access to the Internet and electricity (quality assessment)

Indicate your level of agreement with this sentence from 1 (total disagreement) to 7 (total agreement)	Average
I feel the fee to connect to the Internet is very expensive.	4.20
The provision of electricity is very limited where I am. This is a problem to follow online studies.	4.27
The access to the internet in the place where I am is (from almost impossible = 1, to very good = 7).	4.02
Assess from 1 (never) to 3 (always)	Average
Are you able to follow lessons live through videoconference?	1.73
Do you watch the recorded lessons?	2.14

Thus, new challenges that the war exposed in a more evident way are the availability of electricity and the financial one. These problems hindered many students from registering in the College and hamper their efforts to access to the internet and to follow live videoconferences (See Table 13).

The students also answered about the way they access the internet and the LMS platform (See Table 14).

**Table 14.** Medium of access to the internet and to the LMS (quality assessment)

How do you access to the internet		Access to the LMS	
Mobile Data	59	Through the Mobile Application	42
Starlink	7	Through the Website	31
Wifi	8		
Fiber optics	0		

The MOODLE version allows the students to download learning content when they are online to study it when they are offline. 52 students state to benefit from this possibility while 21 state not to be benefitting from it. The results reveal that the access to the internet is mainly done through mobile data, 59 students out 74 (See Table 14).

The students were invited to compare the different challenges listed until now and mark them from 1 to 6. They identify their financial situation as the main obstacle to continue studying (See Table 15).

**Table 15.** Comparison of challenges (quality assessment)

Question	Average
Financial Problems	4.33
Poor internet connectivity	3.88
My mental state	3.73
The lack of electricity	3.15
The fact of having to move many times	3
The fact of being a displaced/refugees camps	2.93

### 5.5 System assessment

The assessment invited the students to report about their use of the learning management system (LMS) (See Table 16).

**Table 16.** System assessment (quality assessment)

Indicate your level of agreement with this sentence from 1 (total disagreement) to 7 (total agreement)	Average
My user name and password were not working.	2.71
I did not know to whom I should address when I could not enter the system.	2.96
I did not know what to do with the user name and password.	1.82
I entered Moodle but I found it too difficult.	3.24
I entered Moodle but I got lost among too much information.	3.04
The e-Learning platform offers a variety of ways of assessing my learning (quizzes, written work, oral presentation, etc.).	5.54
Student-to-student interaction was more difficult than in face-to-face courses.	5.28
I learned more from my fellow students in this ways than in face-to-face courses.	2.73
The introduction of a virtual tutor helped me to have a point of reference with the College.	5.08
I am disappointed with the way the e-learning platform works.	3.07
I am satisfied with my decision to register and continue my studies via the Internet.	5.76

In spite of the financial, mental and digital limitations, the students are satisfied with the decision to register and continue their studies via the Internet (average of 5.76 out of 7, see Table 16). They appreciate the role of the virtual tutor (average of 5.08 over 7, see Table 16) to have a point of reference with the College.

### 5.6 Courses and lecturers' assessment

The students were invited to assess their interaction with the lecturers, the quality of the courses and their level of satisfaction with the experience (See Table 17).

**Table 17.** Courses and lecturers assessment (quality assessment)

Indicate your level of agreement with this sentence from 1 (total disagreement) to 7 (total agreement)	Average
I found it difficult to communicate with the lecturers in general.	4.53
I received comments on assignments or examinations for this course in a timely manner.	4.07
Some courses were not well prepared.	4.48
Studying via the Internet should allow me to finish my degree in spite of the war.	6.11
The quality of the online courses compared favorably to my other courses face-to-face in Khartoum before the war.	2.17
I feel the quality of the online courses was largely unaffected by conducting it via the Internet.	3.43

Even if students consider that online courses have less quality than the face-to-face ones, they are satisfied with their choice as it should allow them to finish their degree in spite of the war (6.11 out of 7, see Table 17).

## 6. Discussion

In order to contextualize the results in the Sudanese digital landscape, it is necessary to consider that there were 13.99 million internet users in Sudan in January 2024, immediately before the war, which just represents 28.7% of the population (Kemp, 2024). Thus, Comboni College was trying to reach the students through the internet in a country in war with a population with limited digital skills and access to the internet before the conflict. At the same time, the College had made efforts to digitalize its activities in the last years and therefore students and staff were more used to these instruments than the average population (Naranjo Alcaide & Greco, 2023). These facts may have facilitated the adaptation of Comboni College of Science and Technology to the current situation of the country along with the fact of having a reduced number of students, 768 (see Table 1), and teaching staff (47 lecturers). It is always more complex to operate a quick and radical change with a bigger volume of both students and staff. Moreover, the College could find a new location in a former structure related to the founders of the institution, the Comboni Secondary School of Port Sudan.

It is also convenient to consider that the number of mobile connections in Sudan decreased by 4.9 million (-14.4 percent) between the start of 2023 and the start of 2024 (Kemp, 2024). In fact, the ownership of a smartphone may have hindered many students of continuing their academic activities.

The percentage of respondents to the quality assessment carried out in this occasion (54.74%, see Table 7) was lower than the one executed in 2020, when the questionnaire was printed out in paper and distributed among the students. Then the percentage reached 67.67%. In that survey the students of the Diploma in Information Technology-Management were the most active (74.53%) (Naranjo Alcaide & Molineri, 2021, p. 755). This time the students of the BSc in Nursing Sciences students are the most active, which can be easily explained as the physical presence of the leadership of the nursing department in the main office in Port Sudan facilitates their closer follow up. The percentage of respondents in the digital programs, where one could expect a bigger interaction, is similar, from 16.67% to 21.05%, and is much lower among the students of the bachelor arts (BA) in English Language and Literature, 5.88% (See Table 7). It is worth mentioning that while most students of the digital programs are in Juba or Egypt, students of the BA in English are mainly in Sudan with difficult access to the internet. The difference with the students of Nursing Sciences, also present in Sudan, is mainly related to the follow up.

If we compare the students who are not ready to restart their studies because of poor or limited access to the internet (very bad and limited access) with those who cannot pay the academic fees in the first survey, we find similar figures, 65 (See Table 2) and 62 (See Table 3) respectively. A similar figure (65) coincides with the students who did not have a laptop and express themselves as unprepared to start their studies (See Table 7).



## 7. Conclusion

The study shows that it is possible for a higher education institution in a context of civil war to continue its academic activities thanks to the use of digital technologies as far as students and teaching staff have access to the internet and the basic skills to use a learning management system (LMS). This operation implies the development of a certain pedagogy that combines asynchronous tools with few synchronous tools compatible with low connectivity situations and unexpected electricity blackouts.

The necessary learning environment can be created by a simple human structure made of a web developer, a LMS manager, a virtual tutor, an assistant to academic affairs who works with a registrar and the teaching staff (See Figure 1). As for the necessary physical infrastructure, the key point is a central office with an excellent connection to the Internet.

In spite of having a sample of students whose mother tongue is Arabic language (first research question, See Table 9) and who did not have specific training to study through a LMS (second research question), their limited level of English and digital skills are not the main obstacles they face, but their financial constraints caused by the lack of income generating activities during the war (third research question, see Tables 3, 12 and 15). The limitation of financial resources leads to prioritising other aspects over academic fees or access to the Internet. In the case of this study, the College managed to reduce the academic fees thanks to the financial support of a project funded by AICS and carried out in collaboration with AISPO and the donations of particular persons. This support was essential to allow the university not to prioritize financial considerations on the good of students and staff. After the 2014 war in Gaza, universities were perceived as oppressors due to their financial constraints (Jebril, 2024).

The study reveals that in spite of the limitations of the context and the fact that the students prefer the face-to-face learning experience to the online one (See Tables 16 and 17), they express their satisfaction with the decision to continue studies via the Learning Management System as this way will allow them to complete their degree in the midst of the war (See Table 17).

For those students who manage to persevere in such an adverse context some elements look essential like human interaction from the side of the College to support their digital limitations of the students, as they did not have a proper introduction to the use of a Learning Management System, and to alleviate their psychological anxiety and stress. These needs lead to underline the importance of virtual tutors and the tutorial function of lecturers.

Other studies in similar contexts deepen into the impact of the war on the mental status of students and staff and reveal how fear, burnout levels and the loss of relatives increase with the passing of time along the conflict and may heighten levels of anxiety, stress and depression (Kurapov et al., 2024). This research does not deepen into this impact, which could be object for a further study.

Nonetheless, the results of this study and the reports of the virtual tutor confirm the experience of Ukrainian universities where institutions which prioritized the needs and aspirations of their students and staff managed to keep a sense of community in the midst of the conflict. On the other hand, universities in Ukraine found huge support from universities in Western Europe and North America that developed evacuation mobility programs for students and lecturers (Chala et al., 2023). Sudanese universities instead found themselves alone rowing against the current and Sudanese students rarely receive an entry visa even if invited by European universities.

More challenging is the organization of face-to-face training activities as these ones demand physical facilities and presence. Comboni College of Science and Technology limited them to the students of the BSc in Nursing Sciences who were expected to come to the new physical site for their clinical practice. This fact excluded some students from continuing their academic journey.

As for the exams, proctoring companies have developed very advanced technologies to guarantee their safety and integrity. Nonetheless, the problem arises when the student has an internet problem during the exam session.

## Conflict of interest

The author declares no competing financial interest.

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