Journal for Researching Education Practice and Theory (JREPT)
Volume 4, Number 2, 2021 (Special issue), pp. 199-236
ISSN 2616-6828

The Integration of AI and ICT in the Learning Environment: Education Leaders' Perception

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Abstract

This research paper investigates the perspectives of education leaders regarding the introduction and integration of technology in the learning environment. The COVID-19 pandemic's ramifications to the traditional, in-person learning environment was considered as key impetus for the study. The research used an exploratory approach to survey education leaders (n = 70) in Dubai drawn from 8 private schools from secondary down to elementary school. The total student population of these schools was approximately 29,000. Through an author-designed self-administered 61-item, 5-point Likert scale survey instrument, the research collected primary evidence of the perspectives of education leaders regarding the impact of introduction and integration of AI and ICT in the learning environment. The research found that, integration of AI and ICT in the learning environment had a positive impact on learning and teaching. The availability of AI and ICT capabilities played a significant role in transforming the learning paradigm from teacher-centered to student-centered. Generally, education leaders were persuaded that AI and ICT would help in shaping future learning directions and bring about a new generation of students identifiable as 'digital natives' with horizontal classroom participation using ICT and AI tools as opposed to the traditional learning approach. The current paper therefore, proposes the need for integration of AI and ICT into the learning environment at the current backdrop of a global pandemic to shape the forthcoming horizontal, teaching and learning paradigm that will prepare students for a competitive and increasingly pluralistic world.

Keywords: AI and ICT in Learning, Education Leaders, Integration of Technology in Learning, Student-centered Learning, Education Leaders' Perception

Introduction

The underlying purpose of the current study is to investigate the perception of education leaders regarding the introduction of AI and ICT into the learning environment. Based on the current pro-technology dynamics globally, the education systems are increasingly under scrutiny to be at the forefront of adoption of technological competencies and methodologies. Understanding educational leaders' perception on these new developments and how they stand to impact their field of specialty is important. The global contemporary environment for business, learning and/or living is replete with changes inclined to adoption(s) of ICT and currently AI, as main features of investment-specific technologies (Adenji et al., 2018; Hu et al., 2018). The continually technologically-skewed operating environment indubitably requires skilled and technologically savvy human capital. Abor and Tacsir (2017) report that appropriate human capital able to leverage the full effectiveness of the new tools is critical to the success of the current and rapidly prevailing AI and ICT ridden operating environment.

Considering the foregoing therefore, logic dictates that the educational systems of countries need to evolve and be able to play a role in the development of future leaders and global citizens that will be able to use the new technologies. This evolution is through the shift of the current learning paradigms and the introduction of AI and ICT driven learning approaches. The foregoing logic is grounded by evidence of research which underlines the

fact that the type of education provided in different countries is commensurate to the levels of development that the countries experience later on (Bak, 2019; Koerber and Oesch, 2019). Bak (2019) in an empirical study of education in developing countries indicates that short-term economic needs are considered as basis of investments which hinders the long-term efficacy of people and ability of the society to radically innovate. This provides justification of the link between education and development and when contextualized to the purpose of the current study, establishes rationale of why it is necessary to introduce technology into the learning environment.

To fortify the rationale, Delalibera and Cavalcanti (2019) indicate that in the technology-oriented knowledge environment, the acquisition of new knowledge and skills warrant the introduction and continued use of technology-based learning and teaching tools including AI and ICT from a very early age. Inversely therefore, the above means that the teaching fraternity also needs to have the requisite training and preparation to be able to acclimatize to this new learning and teaching paradigm. The knowledge-based economic environment is the foremost factor that ups the demand for technologically savvy workforce therefore compelling the educational system to consider reinforcement of their teaching approaches with new technological capacities.

The advent of COVID-19 further underscores the rationale for technology in the learning

environment as mentioned above having effectively shifted the traditional learning environment and opened more demand for AI and ICT centered learning approaches. According to concurrent evidences of research, it is noted that the fact that the work environment of the contemporary workplace requires knowledge-worker-teams is in itself a reason for the learning environment to ensure that through the use of AI and ICT capabilities in the teaching and learning process, they are able to prepare among students this knowledge-worker-team member capabilities (Wilson et al., 2015; Anastasiades, 2017). Barak (2018) agrees with the foregoing highlighting that millennials are better employees as far as flexibility of operation and operational processes is concerned, online operations, and change appreciation. Barak (2018) underscore the fact that online operations in the current working environment will continue to be the norm and therefore, the need to have employees who have technological skills instilled in them already.

The viability of the above skills in the current operational environment and the future is irrefutable. Take for instance the fact that the current global crisis has crippled the face of the traditional organization. The bureaucracies and protocols of the traditional organizations will become obsolete in the upcoming working paradigm and therefore, having students who already understand the dynamics and dynamism of AI and ICT environments whether working or learning, is critical to future success. Theocaris et al. (2017) note that there is a rapid upcoming change in the global operational environment

towards more creativity; less rigid rules of interaction; fluidity; interaction and emphasis on individual organization for better team participation. Accordingly, Theocaris et al., (2017) in agreement with other scholars mentioned earlier intimate that the educational systems are the springboard for these imminent changes.

In a bid to ensure clarity of the scope, the terms AI and ICT in the learning environment are hereby defined. According to the study, AI and ICT in the learning environment will include any technology based learning enhancements including but not limited to the use of technological devices, learning applications, learning management systems, online learning and automated learning/teaching. This is the delimitation of the terms as used in the current study.

Literature Review

The introduction of AI and ICT in the educational environment has been fanned by proponent scholars to be a doorway to a student-centered horizontal learning. Opponents of the assertions of technology in the education system for instance, Ghravifekr et al. (2016) intimate that, the availability of ICT and AI in the classrooms alone is no solution to the education systems' rigidity in the rapidly dynamic business environment. Mondal (2017) adduces that the school environment has to grapple with multiple obstacles in order to succeed in ensuring that the educational environment is integrated with technological capabilities. Among the main challenges is the teaching fraternity which Mondal (2017)

doubts as fitting to carry out the monumental tasks of overhauling the education system and preparing it for the 21st century demands. Senkbeil (2018) agrees to the foregoing but mentions that the policy of the education system is the main hurdle which has a number of stages. Senkbeil (2018) in support of the teaching fraternity indicates that the education leaders are trainable and have intimated their support for a different teaching and learning approach supported by technology.

Further evidence of research highlights the fact that the change from traditional teaching and learning to contemporary technology-centric learning environment will require a lot of readiness and preparation among learners and education leaders (Sullivan and Puntambekar, 2018). Sullivan and Puntambekar (2018) further highlight that aspects of technology based learning for instance the search for information will have to be taught effectively or else, the databases of knowledge available to learners will be of no objective use. Without proper readiness and preparation, investment in educational technology is bound not to succeed. A case in point is the Kingdom of Saudi Arabia where results of an ICT-centered secondary school's investment were not commensurate with the expectations of the investment (Albugami and Ahmed, 2015). Albugami and Ahmed (2015) intimate that despite significant investment, the lack of readiness on the part of the learners and the education leaders alike rendered the investment obsolete and relegated it to use in the near future while institutions went back to their traditional teaching and learning paradigm. Genlott et

al., (2019) and Fleaca and Stanciu (2019) in an in-depth investigation of the introduction of technology-centered learning in schools noted that, ICT investment should be followed by significant overhaul of educational policies, teacher training and teaching attitudes, and the entire teaching model. According to Genlott et al. (2019) in agreement with Fleaca and Stanciu (2019), this approach ensures that investment in ICT does not go to waste and that the targeted population which includes learners and education leaders does not revert back to the traditional learning and teaching approaches after the introduction of IT in the learning environment.

Scherer et al. (2019) acknowledges the above problem and appreciates that the application of AI and ICT in the learning environment has to be driven with rigor and determination to overhaul the current learning models. Scherer et al. (2019) further notes that there is a challenge and confusion when the two learning modes run concurrently for a long time which then makes it easy for the actors to revert to their previous state of operation. The suggested approach by Scherer et al. (2019) is to have a strict timeline for the implementation of AI and ICT in learning institution and adhering to the timeline to ensure that the objectives are attained. The lack of stringent timelines or the concurrence of two paradigms of learning stand as significant barriers to full implementation of the introduction of AI and ICT in the learning environment. Fleaca and Stanciu (2019) on their part figure that, while there is unanimous consensus among educational stakeholders of the

need to adopt learning to the technological trends of the contemporary world, the investment of AI and ICT in the learning environment is yet to bear the results as expected. Considering the foregoing in juxtaposition with the fact that AI and ICT knowledge is critical in the future operational environment, it is notable that there is need to clearly understand and develop and approach to better integration of AI and ICT in the learning environment.

The main concept underlying the above discussion is the smart education concept. According to evidence of research, the smart education concept is an educational concept that emphasizes on the need to improve the intelligence, creativity and knowledge capacity deliverable to the student so that they may be useful in a rapidly changing and dynamic operational environment (Zhu et al., 2016). In the current educational environment, it is commonly understood that ICT and technology have to spearhead better learning and experience (Uskov et al., 2015; Chen et al., 2017). Chen et al. (2017) further educate that, ICT usage in the educational environment has to be heralded by ICT adoption, ICT acceptance and ICT infrastructure which represent step by step components of effective ICT integration planning for the educational environment. China et al., (2015) conducted an empirical study on the correlation between ICT use and the other critical success factors for ICT integration in the educational environment and noted that, ICT usage among primary school students (n = 2168) was positively correlated with ICT infrastructure.

Nonetheless, China et al. (2015) noted that there were a lot of barriers to the adoption and usage of ICT in the learning environment as per the data collected. The challenges were myriad in nature but all bordered in policy bottlenecks and the lack of readiness among the teaching and learning fraternity. The rationale of the current study is that the changes in policy and teaching paradigm that can help understand the critical success factors for the introduction and integration of AI and ICT in the learning environment in order to lead learning in the current crisis-ridden society, can only be understood through understanding the education leaders' perspective of the new teaching and learning approaches. Based on evidence the research has noted a number of barriers most of which have been studied and presented before the pandemic, there is logical ground to believe therefore that the global pandemic may have enlightened many education leaders on the importance of AI and ICT or technology in general, in the contemporary learning environment. The following summary table juxtaposes the impacts of the introduction of technology in the learning environment for education leaders and students alike. The summary has been derived and collated from the multiple evidences of research studied and consulted:

Table 1. Impact of Introduction of Technology in the Learning Environment

Education leaders	Students
1. Maximization of learning options and approaches based on students' preference.	1. Better and fun learning environment
2. Encourages ease-of-access to learning materials	2. Ease-of-access to learning materials brings about more interest in learning
3. Facilitates collaborative information sharing with other education leaders	3. Students can select preferred learning approaches that best suit their learning needs
4. Leads to faster teaching through eased access to information	4. Promotes collaborative learning encouraging information sharing leading to faster learning
5. Enables the trial and distinction of different teaching instructions and their efficacy leading to better teaching experiences	5. Reduces the monotony of traditional learning models therefore encouraging learning.

The review of literature provides the current study with clear insight of how its purpose is necessary as far as contributing to the body of knowledge is concerned. The research finds gaps in the review of literature bordering on the facilitators of technology introduction in education systems and much more specific to the current study, the perception of education leaders and educational practitioners on the introduction of technology in the schooling environment. While extant literature reviewed herein has highlighted the barriers and challenges of introduction and adoption of technology in the learning environment, there is little information on the facilitators or success factors necessary for successful introduction and adoption of technology in the learning environment. Notably, none of the literature reviewed, had a methodology that focused on the perception of education leaders on the subject matter. In this respect, the research is convinced that by studying the case of Dubai as far as the introduction of technology in the schooling environment is concerned

and focusing on the perception of education leaders, the research will be able to bring a different perspective to the continuum of knowledge in the field which will help improve the understanding of the matter at hand.

Methodology

The current study aimed at gathering education leaders' perception regarding the introduction and integration of AI and ICT in the learning environment. The study targeted eight schools in the Dubai Private Schools sector whose combined student population was more than 29,000 students. A quantitative research approach was adopted and a 5-point Likert scale questionnaire was designed and shared to a total of 70 teaching professionals to self-report on their perceptions regarding introduction and integration of AI and ICT in the learning environment. Through this approach the research would be able to understand the key factors that influenced or potentially influenced the proposal for introduction and integration of AI and ICT into the learning environment in Dubai schools. In pursuit of the foregoing, the research sought to answer the following questions:

RQ1: What are educational leaders' perspectives regarding the advantages of AI and ICT integration in schools for education leaders and students?

RQ2: What are the educational leaders' perspectives regarding the professional need to integrate AI and ICT in their learning and teaching environments?

RQ3: What are the educational leaders' perspectives regarding the challenges of integration of AI and ICT in their learning environments?

RQ4: What propositions are there for successful integration of AI and ICT in the

learning environments as per the educational leaders?

Purposive non-probability sampling approach was applied to enhance the targeted sampling of the participants for the current study. The rationale behind the selection of purposive non-probability sampling was that not all members of staff in the identified educational institutions fitted the inclusion criteria for the study. The inclusion criteria for the study was school heads and deputy heads, department heads and schools team leaders. The foregoing is because this participant would benefit the study by providing a leadership point of view regarding the subject matter. As a precursor to the selection of the education leaders, the research examined KHDA data on schools and their student population. The research then applied strategic logic to focus only on the schools with the highest student population as implementation of AI and ICT in learning in these schools would be more demanding. Eight British and Indian schools were identified as the ones with highest population and elected as the target schools for the study. From these, 70 education leaders were selected. While the research initially intended to have a larger sample size, the restricted interaction because of the COVID-19 pandemic limited the practicality.

The research designed a 5-point Likert scale questionnaire for the purpose of collecting data from the participants. The questionnaire attached in the appendix section of the current study contained four sections. The research developed the questionnaire based on previous works of Radhakrishna (2011) and Balfaqeeh (2011). The total number of items of

measurement contained in the questionnaire were 76. Section A was the demographic section which contained a set of 22 questions. Section B focused on measuring the participant's perception towards the introduction and integration of ICT into the learning environment and this contained a set of 21 questions. Section C sought to find out the modes of tackling the change suggested and the professional requirements thereof and included a set of 16 questions. Section D, tackled the challenges that the integration of AI and ICT in the school environment faced and consisted of 17 measurement items. In an effort to ensure the questionnaire was effective in gathering the projected responses in the subject matter, the research piloted the questionnaire among 7 education leaders and conducted reliability analysis which justified internal consistency of the questionnaire with Chronbach alpha value of 0.92 against the threshold of 0.7.

Since the data collected was numerical, data analysis was carried out using statistical software SPSS v. 23 to underline the quantitative research design. Different sets of analyses were carried out on the data based on the different measurement items and data collected thereof. From the onset, a descriptive analysis was adopted and conducted in order to support the exploratory study's efforts to explore the matter at hand in-depth. Other analyses that were carried out together with the descriptive analysis included the composite scores, and correlation analysis between variables of the study. These analyses were critical in enabling the drawing of comparisons, understanding the strength of the relationships

between variables. The variables analyzed in the study through correlation analysis were AI/ICT advantage for Education leaders, AI/ICT advantage for Students, Implementation of ICT in schools, and, Challenges of Implementation of AI/ICT.

Ethical practice was upheld during the course of the study. Anonymity of the schools as well as the involved education leaders was agreed between the researcher and the schools as well as participants involved as a sign off for their participation. The role of the researcher in the current study was to collect data using the designed and validated questionnaire, and utilize standard statistical measures to analyze the data gathered and use these to make objective interpretation.

Results and Analysis

The conduct of descriptive statistics to understand the demographics of the participants revealed that, 47 of the participants accounting for 67.1% of the sample size were Asian expats including Filipinos, Indians and Pakistanis. Arabs made 14.3% of the sample while Europeans accounted for 15.7% of the sample. This information is contained in Table 2 appended below.

Table 2. Participants nationalities distribution

Nationality	Frequency	Percent
Asian	47	67.1

European	11	15.7
Arab	10	14.3
USA	1	1.4
New Zealand	1	1.4

In terms of age distribution, 38 of the participants accounting for 54.3% of the sample size were between ages 31 and 40. On the other hand, 24.3% of the remaining participants were between ages 41 and 50. These two age brackets formed the bulk of the participants. Table 3 appended below presents this information.

Table 3. Participants ages distribution

Age	Frequency	Percent
20-30	5	7.1
31-40	38	54.3
41-50	17	24.3
51-60	8	11.4
Above 61	2	2.9

In terms of gender, in line with expectation as far as the schooling system is concerned, the female population outnumbered the male population with 54 of the participants accounting for 77.1% of the total sample. Table 4 below presents the gender distribution above mentioned.

Table 4. Participants gender distribution

Gender	Frequency	Percent
Male	16	22.9
Female	54	77.1

The research was also interested in the educational demographics of the participants. The data collected indicated that slightly above 50% of the sample size, precisely 36 of the participants were bachelor degree holders while only 2 of the participants were doctors. The following information is presented in Table 5 below.

Table 5. Participants educational qualifications distribution

Certificate	Frequency	Percent
Diploma	4	5.7
Bachelors	36	51.4
Masters	27	38.6
Doctorate	2	2.9
Other	1	1.4

The research sought to document the areas of specialty of the education leaders which would impact their perception of the introduction and integration of AI and ICT into the learning environment. The demographic data collected revealed that 20 of the participants, making up 28.6% of the sample size were ICT education leaders. Class teacher and student education segment formed the other most populous specialty with 14 of the education

leaders accounting for 20% of the sample falling in this segment. This was followed closely social sciences and language and other, segment which both had 13 education leaders accounting for 18.6% of the sample size. The other segment was chosen by education leaders whose specialty included school improvement, business and curriculum development. The above information is presented in Table 6 below.

Table 6. Participants teaching specialty distribution

Specialization	Frequency	Percent
Science and Math	10	14.3
ICT	20	28.6
Social Sciences and Language	13	18.6
Class teacher and Education	14	20.0
Other	13	18.6

The research sought to collect data from teaching leaders and therefore, the largely held position by most of the education leaders who were not currently holding principal or vice principal positions was senior education leaders with almost 50% of the sample size, precisely 34 education leaders holding this position. The rest of the sample included supervisors, principals and vice principals who indicated that they had years of teaching experience as part of their journey to current positions. Table 7 below summarizes the above information.

Table 7. Participant's job title distribution

Job Title	Frequency	Percent
Senior teacher	34	48.6
Supervisor	20	28.6
Vice principal	9	12.9
Principal	7	10.0

The research conducted a descriptive analysis to gauge the participants' individually rated AI/ICT proficiency and usage in general. The proficiency of AI/ICT usage was broken down into three stages as reflected in Table 8 below.

Table 8. Participants AI/ICT proficiency

AI/ICT Proficiency	Frequency	Percent
Beginner	1	1.4
Average	49	70.0
Advanced	20	28.6

The above analysis reflected clearly that most of the education leaders had significant grasp of AI/ICT. The research therefore interrogated their individual usage and integration of the same to their daily activities and Table 9 below summarizes the findings.

Table 9. Participants AI/ICT integration to teaching activities

Integration of AI/ICT in Work Activities	Frequency	Percent
Daily	57	81.4
1 week	3	4.3
2-3 week	8	11.4
1 month	2	2.9

The findings from the analysis of the integration of AI/ICT to teaching activities as per the data gathered showed that 57 of the participants accounting for over 80% of the sample size used AI/ICT daily in their teaching activities. 3 of the participants mentioned that they integrated AI/ICT once a week, 8 others mentioned that they integrated AI/ICT after every fortnight while 2 of them mentioned the use of AI/ICT only once a month. The research therefore inquired on whether the education leaders had received any training related to AI/ICT in education and while 58.6% confirmed to have received training, they mentioned that it was general training detached from specific AI/ICT educational training. However, the remaining 48% of the participants noted that they had received AI/ICT educational-based training.

As indicated earlier in the methodology section, the eight schools that were used in the current research were of diverse curricula. The Indian curriculum made 52.9% of the schools, precisely 37 of the schools studied. The British curriculum accounted for 22.9%, precisely 16 of the schools studied while the IB curriculum accounted for 13 of the

remaining schools, a total of 13.6% of the sample size. This descriptive information is shared on Table 10 below.

Table 10. School curricula distribution

School Curriculum	Frequency	Percent
American	4	5.7
British	16	22.9
IB	13	18.6
Indian	37	52.9

The schools mostly had a multilevel configuration as revealed in Table 11 below.

Table 11. School level configurations

School Configuration	Frequency	Percent
Elementary	3	4.3
Intermediate	1	1.4
Secondary	34	48.6
Mixed	32	45.7

The access of AI/ICT in the different schools was interrogated and the participants revealed overwhelmingly that students had access to computers in the computer labs. A total of 61 of the participants corroborated this information while 9 of the participants mentioned that they too had similar access. Some of the participants also noted the availability of access

to ICT devices in the libraries for both students and education leaders. There was also some provision of iPads and wireless access to internet in the classrooms.

The goal of the research being to understand the perception of school heads regarding the adoption, implementation and integration of AI/ICT into the learning environment, a Likert scale was used to measure the perception of education leaders subject to particular statements in sections B, C and D of the questionnaire. In measuring this, the research sought to determine the participants' level of agreement and therefore the scales were 1 for strongly agree and 5 for strongly disagree. Scores higher than 3 were identified to be towards agreement based on means of the responses with the highest mean indicating the strongest agreement of the participants.

Section B of the questionnaire showed a generally positive agreement among the education leaders. The following Table 12 presents the results of the participants regarding section B with the corresponding standard deviations.

Table 12. Professional perspective of education leaders regarding AI/ICT in schools

B - Professional Perspective of AI/ICT in Schools			
		Mean	SD
1	AI/ICT makes student job ready	4.77	0.42
2	AI/ICT boosts academic achievement	4.34	0.68
3	AI/ICT fosters participative learning	4.43	0.69
4	AI/ICT promotes individual learning	4.34	0.64

5	AI/ICT leads to collaborative learning	4.27	0.64
6	AI/ICT supports project-based learning	4.51	0.61
7	AI/ICT makes students independent	4.37	0.71
8	AI/ICT provides drills for exercise	4.01	0.81
9	AI/ICT leads to learning interest development	4.50	0.65
10	AI/ICT promotes organized learning	4.29	0.75
11	AI/ICT promotes organized teaching	4.50	0.53
12	AI/ICT improves teacher connectivity	4.46	0.72
13	AI/ICT improve teaching techniques	4.47	0.70
14	AI/ICT leads to improvement communication	4.20	0.85
15	AI/ICT makes teaching smooth	3.83	1.06
16	AI/ICT is accommodative of learning styles	4.06	0.70
17	AI/ICT provides variety of teaching materials	4.40	0.52
18	AI/ICT makes students less anxious	3.86	0.95
19	AI/ICT leads to quicker teaching	4.00	0.92
20	AI/ICT leads to efficient task completion	3.89	0.88
21	AI/ICT leads to quicker curriculum completion	3.64	1.05

Based on the statement and the measurements thereof, the highest mean was recorded by the statement suggesting AI/ICT make the student job ready at 4.77 and an SD of 0.62. Measurement item number 6 inquiring on whether AI/ICT support project-based learning also recorded a high mean score of 4.51 and SD of 0.61. The lowest mean score on education leader's perception of AI and ICT in the classroom environment was noted under the statement measuring whether ICT helped in quicker curriculum completion at 3.64 and SD 1.05. The mean score was higher than 3 which was the threshold for positive agreement

as indicated earlier but it reflected something very critical about the education leaders' perception of the role of AI/ICT in the class room environment.

Section C covered education leader's perception of the implementation of AI/ICT in the learning environment and the professional development requirements thereof. The responses from the participants showed overwhelming agreement with 4.10 being the lowest mean. Education leaders indicated the need to provide them with training on the use of AI/ICT in the learning environment including but not limited to the collection, organization and execution of learning resources. The lowest mean was related to the question that AI and ICT in the school environment will lead to organizational change – which was a clear indication of the perception of education leaders regarding these disruptive technologies and their cling on the status quo. Table 13 below presents the data from section C.

Table 13. Perception of education leaders on AI and ICT integration in the school environment as well as training requirements

	C – AI/ICT introduction, implementation and integration in Schools and the training requirements		
		Mean	SD
1	Schools work towards AI/ICT integration	4.41	0.58
2	Ample time has been set aside for the integration	4.30	0.645
3	There is provision of academic software by schools	4.36	0.68
4	There is provision of required training by schools	4.34	0.68
5	There is encouragement to learn about ethical issues by schools	4.20	0.67

6	There is encouragement towards the integration of AI/ICT in the administration centers	4.33	0.61
7	Sufficient protection is in place from bad content	4.30	0.58
8	Schools understand AI/ICT integration will bring organizational change	4.14	0.62
9	AI/ICT is useful in the organization and analysis of data	4.40	0.60
10	AI and ICT in schools is used to organize resources	4.40	0.55
11	There is provision of release time	4.30	0.73
12	There are sufficient computers in the schools	4.34	0.68
13	Schools help in providing assessment for the influence of AI and ICT in learning	4.30	0.55

The obstacles impacting the integration and implementation of AI and ICT in the learning environment were captured and tackled in section D of the questionnaire. Participants were in general agreement about most of the obstacles and the one that recorded the highest mean score was for two statements which considered lack of infrastructure and sufficient transition or implementation time as the primary obstacle. These two statements scored a mean of 3.11 at standard deviations of 1.09 and 1.03 respectively. A statement identifying negative attitude towards the implementation and integration of AI and ICT in the learning environment, from the administration scored the lowest mean at 2.21 and an SD of 0.93 – a clear indication that there was not negative attitude towards implementation from the school leaderships. Table 14 below relays the above information.

Table 14. Obstacles of the implementation of AI/ICT in the school environment

	D – Obstacles of AI/ICT integration and implementation in the school environment		
		Mean	SD
1	Lack of proper infrastructure	3.11	1.19
2	Resistance from education leaders	2.54	1.03
3	Lack of sills among education leaders	2.71	0.98
4	Poor policy regarding the introduction of AI and ICT in the school environment	2.39	0.98
5	Lack of confidence among education leaders	2.83	1.01
6	Poor and negative attitude from school administration	2.21	0.93
7	Education leaders' incompetency	2.81	1.00
8	Short timelines for implementation	3.11	1.03
9	Inaccessibility of computers	2.59	1.08
10	Unavailability of technical support	2.79	1.15
11	Reliance on traditional pedagogy	2.74	1.09
12	Resistance of education leaders to new pedagogy	2.67	1.02
13	Inaccessibility of requisite financial support	2.80	1.16
14	Cultural barriers	2.34	0.88
15	Resistance from parents	2.43	0.91
16	Lack of support from top management	2.31	0.83
17	Too many curriculum requirements	2.91	1.07

Were it not for the small sample size used for the current research which was contributed to in part by the small timeline that was available to conduct the research, the study would have applied factor analysis to reduce the data and determine overall scores for each of the main segments of the data gathered. The research, to circumvent this and proceed with in-

depth analysis elected to conduct correlations analysis for items in each of the three constructs and select high correlations items – then create composite scores for the sections based on the high correlation items.

The resulting correlations led to the creation of 4 composite scores due to the fact that section B was split into two. The two splits included those measuring advantages of AI/ICT to students and the other measuring the same for education leaders. Apart from section B, all the other sections' items of measurements were strongly correlated and were thus used in the computation of the composite scores as were in the questionnaire. For section B, poor correlation was noted with one of the item of measurement – item one which inquired whether AI/ICT in the school environment made a student job ready. This item was thus left out among the items considered in part A of section B where the impact of AI/ICT on the student was the focal point.

Through a descriptive analysis of the composite scores (4 in number) as outlined above, the research noted that there was strong agreement with the 4 composite scores which was reflected by strong means in the 5-point Likert scale. Schools implementation of AI/ICT taken mainly from section C of the questionnaire scored the highest average at 4.32 with a standard deviation of 0.47. This was a clear indicator that education leaders had a positive outlook towards the implementation of AI/ICT in the school environment especially in

crisis periods and/or for the purpose of the future environment. Challenges in the implementation of AI and ICT in the school environment recorded a minimal mean of 2.67 with a standard deviation of 0.75. This was a clear indication that the school leaders who participated in the research were not at all in agreement with the notion of obstacles towards the implementation of AI and ICT in the school environment. The composite score means are captured in Table 15 below.

Table 15. Composite scores of constructs based on high correlation items of measurement

Composite Scores	Mean	SD
AI/ICT advantage for Students	4.24	0.52
AI/ICT advantage for Education leaders	4.19	0.57
Implementation of ICT in schools	4.32	0.47
Challenges of Implementation of AI/ICT	2.67	0.75

Research evidences from Stat Soft (2012) indicates that the t-test is a commonly used analytical method to analyze the difference of means between groups. The research conducted a t-test to compare the means of ICT proficiency and the four constructs composite scores. The aim was to find out whether there were any significant differences

when considering the impact of AI/ICT for students and education leaders as well as the question of challenges and school implementation of AI and ICT into the learning environment. The results presented one significant result that contradicted previously shared results regarding the challenges to the implementation of AI and ICT in the school environment. A t-value of 2.49 was registered at statistical significance $p = 0.02$ meaning that based on the ICT proficiency demographics shared earlier, there was a t-test correlation with the challenges in the implementation and adoption of AI/ICT in the school environment. This may be due to the fact that 49 of the participants, accounting for 70% of the total sample only noted to have average AI and ICT proficiency hence agreement regarding the challenges for the implementation of the same in the school environment. The rest of the t-test relationships did not meet the acceptable threshold for statistical significance of $p < 0.05$ therefore, their interpretation was ignored. Table 16 below summarizes the said information.

Table 16. T-test for AI/ICT proficiency and 4 composite constructs

Proficiency					
AI/ICT advantage for Students	Average	4.22	0.53	-0.36	0.73
	Advanced	4.27	0.48		
AI/ICT advantage for Education leaders	Average	4.20	0.59	0.31	0.76
	Advanced	4.15	0.54		

Implementation of AI/ICT in schools	Average	4.36	0.46	1.20	0.24
	Advanced	4.21	0.49		
Challenges of Implementation ICT	Average	2.80	0.75	2.49	0.02
	Advanced	2.34	0.68		

The relationship between the items of measurement and the constructs thereof was analyzed through a correlation of the four constructs namely – AI/ICT student advantages, AI/ICT teacher advantages, school implementation of AI/ICT and the challenges of the implementation of the same. A significantly strong r correlation value of 0.77 at statistical significance $p = 0.00$ was registered for the advantages of AI/ICT impact in students and the same for education leaders. The research also registered a strong r value for the school's implementation of AI/ICT and the advantages of the same on the students at $r = 0.65$ at $p = 0.00$. There was a negative correlation between the challenges of the implementation of AI and ICT in the learning environment and the advantages of AI and ICT on the students at $r = -0.06$ at a statistical significance value $p = 0.06$. This reflected a weak negative correlation which was partly insignificant based on the p-value threshold of $p < 0.05$. Table 17 below reflects the above information.

Table 17. Correlation Results of Research Variables

		ICT's advantage for Students	**ICT's advantage for Education leaders**	**School's Implementation of ICT**	**Challenges of Integrating ICT**
ICT's advantage for Students	Pearson Correlation	1	0.77**	0.65**	-0.06
	Sig. (2-tailed)		0.00	0.00	0.62
ICT's advantage for Education leaders	Pearson Correlation		1	0.59**	0.06
	Sig. (2-tailed)	.000		0.00	0.65
School's Implementation of ICT	Pearson Correlation			1	0.18
	Sig. (2-tailed)	.000	.000		0.15
Challenges of Integrating ICT	Pearson Correlation			1	
	Sig. (2-tailed)	0.62	0.65	0.15	

Through the rigorous data analysis process, the following key findings were established.

- Education leaders had a positive outlook towards the implementation of AI/ICT in the school environment especially in crisis periods and/or for the purpose of the future environment.
- Education leaders who participated in the research were not at all in agreement with the notion of obstacles towards the implementation of AI and ICT in the school environment.
- A significantly strong r correlation value of 0.77 at statistical significance p = 0.00 was registered for the advantages of AI/ICT impact in students and the same for education leaders.
- The research also registered a strong r value for the school's implementation of AI/ICT and the advantages of the same on the students at r = 0.65 at p = 0.00.
- There was a negative correlation between the challenges of the implementation of AI and ICT in the learning environment and the advantages of AI and ICT on the students at r = -0.06 at a statistical significance value p = 0.06.

Discussion

As summarized in the concluding part of the previous segment, certain findings were critical to note, (1) the perception of education leaders on the implementation of AI/ICT in the education environment which was strong positive. (2) Low perception as to the validity of the challenges listed in the questionnaire regarding the implementation of AI/ICT in learning environment an indication that certain other aspects bordering mostly on policy were the primary bottlenecks. (3) A significantly strong r correlation value of 0.77 at statistical significance p = 0.00 was registered for the advantages of AI/ICT impact in students and the same for education leaders. The research also registered a strong r value

for the school's implementation of AI/ICT and the advantages of the same on the students at $r = 0.65$ at $p = 0.00$. There was a negative correlation between the challenges of the implementation of AI and ICT in the learning environment and the advantages of AI and ICT on the students at $r = -0.06$ at a statistical significance value $p = 0.06$.

From the current research, the role of leadership in the attainment of digital learning through the integration of AI and ICT in the learning environment has been established. Through the data collected and analyzed, it has remained crystal clear that the leadership of educational institutions have the ball on their court regarding ensuring that there is sufficient capacity to transform to digital learning. There has also been significant blame in other stakeholders including but not limited to government as far as infrastructure and funding is concerned. However, it is unequivocal that despite the fact that there is a global interest in the transitioning of the learning environment from traditional learning to digitized learning, the achievement of this is still far away and may require joint efforts from education leaders supported by stakeholders. Earlier reviewed literature noted the importance of leadership of educational institution and stakeholder cooperation in the establishment of better performing digitized learning institutions (Sullivan and Puntambekar, 2018; Albugami and Ahmed, 2015; Genlott et al., 2019; Fleaca and Stanciu 2019). This has been confirmed from the current study which has noted the perception of education leaders regarding the introduction and integration of AI/ICT in the learning

environment to be in positive agreement with most of the obstacles identified and measured in the study.

Concurrent evidence of research supports the findings mentioning that integration of AI/ICT in the learning environment is still complex and developing phenomenon (Pelgrum and Law, 2003; Sanchez-Pietro et al., 2017). Considering the above in the context of the current global crisis, it can be stated categorically that there is need to expedite the readiness of the education system from education leaders to students to all other stakeholders to acclimatize to the fact that there is need to transform the educational paradigm from traditional to digital. From the perspectives of the education leaders interrogated in this research it is clear that the implementation and integration of AI/ICT in the learning environment is still in its very maiden stages. In the face of the crisis currently engulfing the world, this calls for speedy action to remedy the situation and ensure learning can go on seamlessly if the crisis lasts longer.

Conclusion

The current study has a few contributions that it makes to the field of study that it has focused on – education and technology in crisis. The first contribution is the development of survey tool that is instrumental in the interrogation of the perception of education leaders regarding the integration of AI/ICT tools in the learning environment. The second

contribution of the current study is the provision of empirical evidence from 70 school leaders in the Emirate of Dubai regarding their perception of the integration of the AI and ICT tools in the learning environment which is a maiden step into research on the use of technology in leading education in the 21st century and in times of crisis.

Thirdly, the research has effectively interacted primary and secondary research thereby providing a clear reflection into extant literature regarding the subject matter and establishing the perception of leaders regarding the complexities, advantages and implementation strategies for AI and ICT in the learning environment in Dubai. These results can be transferred to other cities and the methodology applied to find out whether the perception of school leaders in other cities is similar to that of the education leaders in Dubai.

In a nutshell, the research finds that school leaders are affirmative about the integration of AI and ICT in the learning environment in schools in Dubai. This is reflected by their strong agreement with items of measurement used that interrogated on the advantages of AI and ICT for education leaders and students in the learning environment. The education leaders also significantly agreed with the implementation of AI and ICT in schools and the professional training requirements needed. This was proof that there is need for readiness among education leaders and students for the effective integration of AI and ICT in the

learning environment. As far as the challenges to implementation were concerned, lack of time and infrastructure were identified as key obstacles. This reiterates evidence from extant literature that noted the need for readiness and appropriate time space for the comprehensive implementation of AI and ICT in the educational environment.

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