Technical Readiness of the Faculty Members at Cairo University for Implementing e-Assessment

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ABSTRACT

Universities around the world are rapidly and competitively introducing ICT into teaching & learning, management and assessment. E-assessment readiness evaluation is critical to the success of e- assessment adoption and implementation. Threfore, the readiness of the faculty members at Cairo University, Giza, Egypt for implementing e-assessment system was assessed. A valid and reliable constructed questionnaire based on the 5-point Likert scale was developed and used to evaluate their technical readiness for the computer-based assessment (CBA). The mean score 3.41 was treated as the minimum acceptable level of readiness for each item or construct. Indicative colors were used to indicate the level of readiness: 1-2.6= red color (not ready and needs hard work), >2.6-3.4=orange color (not ready and needs some work), >3.4-4.2= yellow color (ready but needs some improvements) and >4.2-5.0= green color (ready, go ahead). 307 Faculty members and teaching assistants belonging to three faculties viz., Agriculture (Agri), Physio-Therapy (PT) and Dar el-Olum (Dar) were surveyed.

The results revealed that the vast majority of the faculty members possess a smart device and have access to the internet. However, they lack the experience needed for CBA. Their basic computer skills and internet skills were rather satisfactory (3.57 & 4.05, respectively= yellow) but still in need of further improvements. Both CBA skills (2.46) and CBA content (2.83) were not ready yet; the former needs hard work (Red) and the latter needs some work (orange). As

regarding the overall technical readiness, the faculty members are not ready so far (3.23, orange) and some work is still needed.

The study concluded that the faculty members and teaching assistants at Cairo University are not technically ready so far for CBA implementation and some effort has to be exerted. The present study has gone some way towards enhancing our understanding of the readiness for CBA. However, further research should be undertaken in other relevant areas.

Key Words: e-learning- e-assessment- computer-based assessment (CBA)- e-readiness.

مستخلص البحث باللغة العربية

تتنافس الجامعات في جميع أنحاء العالم في إدخال تكنولوجيا المعلومات والاتصالات بصورة متسارعة في مجالات التعليم والتعلم، والتقويم، والإدارة. ويعد قياس مستوى جاهزية هذه المؤسسات لتطبيق نظم التقييم الإلكتروني لأداء الطلاب أمرًا ضروريًا لنجاح اعتماد التقييم الإلكتروني وتنفيذه. لذلك عنيت الدراسة الحالية بقياس مدى استعداد أعضاء هيئة التدريس ومعاونيهم بجامعة القاهرة، الجيزة، مصر لتنفيذ نظم التقييم الإلكتروني. تم تطوير استبيان مبني على مقياس ليكرت الخماسي وبعد التأكد من صدقه وثباته، تم استيفاؤه من قبل ٣٠٧ من أعضاء هيئة التدريس ومعاونيهم ينتمون إلى ثلاث كليات هي الزراعة، والعلاج الطبيعي، ودار العلوم بغرض قياس مستوى الاستعداد التقني لديهم لتطبيق نظم التقييم الإلكتروني. تم التعامل مع المستوى ٣.٤١ على أنه المستوى الأدنى المقبول للاستعداد لكل بند أو محور، وتم التعبير عن مستوى الاستعداد الفعلي باستخدام الألوان الدالة: ١-٢.٦ = اللون الأحمر (غير جاهز ويحتاج إلى عمل شاق)، > ٢.٦-٣.٤ = اللون البرتقالي (غير جاهز ويحتاج إلى بعض العمل)، > ٣.٤-٤.٢ = اللون الأصفر (جاهز ولكنه يحتاج إلى بعض التحسينات)، > ٤.٢-٥.٠ اللون الأخضر (جاهز، انطلق).

كشفت النتائج أن الغالبية العظمى من أعضاء هيئة التدريس يمتلكون أجهزة إلكترونية ذكية مع إمكانية الوصول إلى الإنترنت، إلا أنهم يفتقرون إلى الخبرة اللازمة لتطبيق نظم التقييم الإلكتروني. من ناحية أخرى جاءت مهاراتهم الأساسية في الحاسب، والإنترنت مُرضية إلى حد ما (٣.٥٧ و٤.٠٥، على التوالي- لون أصفر) ولكن لا تزال بحاجة إلى مزيد من التحسينات، في حين كانت مهاراتهم في استخدام نظم التقييم الإلكتروني غير مرضية (٢.٤٦- لون أحمر) وتحتاج إلى عمل شاق. من ناحية أخرى أظهرت الدراسة عدم جاهزية المحتوى اللازم لتطبيق نظم الاختبارات الإلكترونية (٢.٨٣- لون برتقالي) والذي يحتاج إلى بعض العمل. وبصفة عامة فقد أظهرت الدراسة أن أعضاء هيئة التدريس ومعاونيهم بجامعة القاهرة ليسوا مستعدين تقنيا (٣.٢٣-لون برتقالي) حتى الآن لتطبيق نظم الاختبارات الإلكترونية، وأنه يجب بذل المزيد من الجهد لتنمية مهاراتهم في هذا المضمار. وأوصت الدراسة بإجراء المزيد من البحوث في المجالات الأخرى ذات الصلة.

الكلمات المفتاحية: التعلم الإلكتروني، التقييم الإلكتروني، التقييم القائم على الحاسوب، الجاهزية الإلكترونية.

- **INTRODUCTION:**

The world is entering the Fourth Industrial Revolution. Information and communication technologies (ICTs) are the backbone of this revolution. Processing and storage capacities are rising exponentially, and knowledge is becoming accessible to more people than ever before in human history. The future holds an even higher potential for human development as the full effects of new technologies such as the Internet of Things (IOT), artificial intelligence (AI), 3-D Printing, energy storage, and quantum computing unfold. The future of countries, businesses, and individuals will depend more than ever on whether they embrace digital technologies. And many of those who stand to gain the most are not yet connected **(WEF, 2016).**

With the advancement of technologies, students or learners are increasingly having easy access to electronic media, thanks to the availability of electronic devices such as laptops, tablets and smartphones. This has prompted many educational institutions around the world to adapt to the current lifestyle of learners, by switching teaching and learning methodologies from traditional classroom set-ups to those that embrace electronic formats. As a result, e-learning has become the buzzword in many educational institutions (**Yew and Jambulingam, 2015).**

Universities around the world are rapidly and competitively introducing ICT into all aspects of their core business. ICT provides universities with unprecedented and extraordinary opportunities in the fields of teaching & learning, management and assessment. E-learning and e-assessment are major fields in which ICT is invested.

The integration of ICT in education has revolutionalised and transformed the education sector worldwide and created positive impacts. In developing

countries e-learning is still in its infancy and early adoption stage, and the countries experience challenges unique from developed countries **(Bhuasiri et al., 2012).** Assessment is an integral part of any curriculum. E- assessment may be an integral part e-learning system or a standalone solution. E-learning is being implemented more and more frequently in higher education, creating new and exciting opportunities for both educational institutions and students **(Wagner et al., 2008).**

El-Shenawi (2005) observed that, in spite of the efforts of the Egyptian MOHE to integrate technology into the education system, results are far behind what was intended. This has been attributed to different factors.

In its broadest sense, *e-assessment (EA),* sometimes called *technology-enhanced assessment (TEA),* is the use of information technology for any assessment-related activity. **(Wikipedia, 2018).** ICTs offer many new possibilities for successful assessment. As ICTs were integrated in learning and assessment, educators demanded more effective, flexible, interactive, customized and just-in-time online instructional and assessment systems. Research exploring the role of ICTs in the teaching, learning and assessment process conclude that online learning and online assessment are impacting pedagogical developments in higher education **(Jamil et al., 2012).**

In the recent past, there has been a dramatic shift in the procedures and methods of assessment in higher education. Assessment and feedback lie at the heart of the learning experience and forms a significant part of both academic and administrative workload **(Ulster University, 2017).**

It appears that students are less satisfied with assessment and feedback than with any other aspect of the higher education experience particularly in an ICT-

dominated world. In this respect, one cannot ignore the driving force of the recent advances in ICT and their impact on education. Thus, the current trend has to provide a wider and more flexible range of assessment methods to match and support the wider range of knowledge, understanding and skills required in the digital age. E-assessment methods may be of great benefit in this context that will match learners' interests and satisfy their digital needs. In general, technology-enhanced assessment and feedback practices provide several benefits.

My own experience as a faculty member at Cairo University and the preliminary survey showed that e-assessment systems as standalone ones are almost missing in Cairo University. In addition, the partial adoption of e-learning by some faculties, is restricted. It is, if exists, still in its immature stage. Some hindering factors are legality reasons, unavailability or weakness of technological infrastructure, non-readiness of content, faculty, student, support systems and administration systems.

According to **Davidson and Schofield (2002),** implementing technology-enabled education requires the identification of barriers and obstacles prior to implementation so that plans can be drawn to address those challenges. Such planning entails a complex process, which ideally, should be institution-specific. In line with this, assessing readiness for e-assessment is critical as it provides the institution with the key information on the distinctive characteristics that will enable it to determine its capability of implementing e-assessment.

Therefore, the present study assesses the academics' technical readiness for implementing e-assessment at Cairo University (CU) as an inevitable requirement for developing, and enabling and maintaining e- assessment systems.

RESEARCH PROBLEM

In spite of the efforts of the Egyptian Ministry of Higher Education (MOHE) to integrate ICT into the education system at universities, results are far behind what was intended. Cairo University has its own e-learning center with some focal points at some faculties. Nevertheless, e- assessment, as a component of e-learning or as a standalone system, is missing or, if exists, is still in its infancy stage. The present study is an attempt to assess CU faculty members' readiness for implementing e-assessment.

RESEARCH QUESTIONS

The research is an attempt to answer one major question: are CU academics technically ready for CBA implementation? This, in turn, comprises nine subsidiary questions that have been formulated as follows:

1. Do Faculty members have personal access to technology?
2. Do Faculty members have back experience in CBA?
3. Do Faculty members have the basic computer skills?
4. Do Faculty members have the basic internet skills?
5. Do Faculty members have the basic CBA skills?
6. Is CBA content ready?
7. Is there a difference among colleges in readiness?
8. Is there a difference among academics in readiness?
9. Is there a difference between genders in readiness?

RESEARCH GOAL

The overall goal of the current study is to assess the readiness of the faculty members at CU for CBA as a major category of e-assessment. The study was a survey meant to collect primary data from academics at CU in Egypt to answer one major question: "How technically ready are CU academics for implementing CBA?"

RESEARCH SIGNIFICANCE

There is little, if any, research done into assessing the readiness of the stakeholders for e-assessment at the Egyptian universities. The results of the study are expected to reveal the extent of technical readiness of CU academics for implementing e-assessment and help identify the issues that need improvement or even those which might impede this implementation.

RESEARCH TERMINOLOGY

1. **Assessment:**

Assessment is an ongoing process of gathering evidence about students' performance and creating an enabling feedback mechanism to improve their learning. **(Chaudhary, 2013).**

2. **e- Assessment and CBA assessment:**

According to Jisc (2006), E-Assessment is the end-to-end electronic assessment processes where ICT is used for the presentation of assessment activity, and the recording of responses. Various terms are used to describe the use of a computer for assessment purposes. These include: Computer-Assisted Assessment (CAA), Computer-Based Assessment (CBA), and Online Assessment. Although these terms are commonly used interchangeably, they have distinct meanings. Computer-Based Assessment (CBA) refers to assessment which is built around the use of a computer; the use of a computer is always intrinsic to this type of assessment. The defining factor is that the computer is marking or assessing the responses provided from candidates. It can be performed on any equivalent smart device. CBA systems enable educators and trainers to author, schedule, deliver, and report on surveys, quizzes, tests and exams. They may be a stand-alone system or a part of a virtual learning environment, possibly accessed via the World Wide Web (online exams). It should be noted

that there are two types of CBTs, linear and adaptive **(Alabi et al., 2012; Mikelloydtech, 2012 and NCME, 2018).** For the sake of this research, e- assessment will be used operationally to refer to *"the assessment and feedback practices provided by both the CBA and online assessment*".

3. Readiness and e-readiness:

According to **Oxford dictionary**, "readiness" is: *The state of being fully prepared for something, willingness to do something or the quality of being immediate, quick, or prompt.* **(Oxford dictionary)**

In fact, the technical meaning of readiness is not likely to differ from the linguistic one. However, fine adjustment of the definition should be done according to the context in which the term is used. E-readiness was technically defined as the extent of readiness in access to network infrastructures and technologies **(DIT, 2003).** However, this definition disregards the required skills and positive attitudes towards adopting, implementing and utilizing ICT.

In this study we will operationally define the academics' readiness for e-assessment as *"their preparedness and skillfulness to implement, utilize and sustain CBA".*

LITERATURE REVIEW

Assessment:

Assessment and feedback lie at the heart of the learning experience and forms a significant part of both academic and administrative workload. **(Race et al., 2005; Jisc, 2010 and Ferrell, 2013).** Thus, the current trend has to provide a wider and more flexible range of assessment methods to match and support the wider range of knowledge, understanding and skills required in the digital age **(Ulster University, 2017).**

Number of influences has brought assessment and feedback to the forefront of institutional and educational agendas, resulting in an increasing imperative to enhance assessment and feedback practices through technology **(Jisc, 2010).**

E-assessment:

E- learning, including e-assessment, lies under a more generic term called Technology- Enhanced Learning (TEL) **(UCISA, 2016).** According to **Jisc (2006),** e-Assessment is the end-to-end electronic assessment processes where ICT is used for the presentation of assessment activity, and the recording of responses. This includes the end-to-end assessment process from the perspective of learners, tutors, learning establishments, awarding bodies and regulators, and the general public (**Jisc, 2006).**

On the other hand, e-assessment is used as an overarching term, defined as; "the use of electronic systems for the development, operation and delivery of accredited qualification assessment or the collection of performance evidence, which contributes to the awarding of a unit or an accredited qualification" **(Ofqual, 2007).**

e-Assessment connotes using electronic technology and tools to design and administer assessments, collect and store students' assessment evidences, grade performance, provide feedback and generate reports. e-Assessment process involves "assessment scheduling; submission of assignments; tracking of submissions; extension requests and approvals; academic integrity; academic misconduct processes; examinations; marks recording; moderation and external examining" **(Ferrell and Gray 2013).** Thus, an integrated e-assessment system facilitates e-submission, e-marking, e-grading, e-feedback and e-reports. **(Koneru, 2017).**

e-assessment and the 21st Century Skills

Pencil and paper testing won't help much in diagnosing and assessing whether students have acquired 21st Century Skills or not, so it's reasonable to conclude that e-assessment has a big future (**Mikelloydtech, 2012).**

A review was carried out by CCEA Regulation and SQA in 2015, looking at e-assessment practices in a sample of countries, including; Canada, Switzerland, Singapore and Australia. The use of ICT in education in general is increasing and it appears to be encouraged across a number of education systems. There is more evidence for the use of e-learning; however, there are developments noted that indicate a move towards e-assessment, made possible by developments in technology. In these countries, e-assessment offers the opportunity to respond to the cry for 'real world' education by enabling alternative assessment environments (**CEA, 2018).**

E-assessment: the high stakes strategy

E-assessment is becoming an increasingly hot topic, with an increasing number of governments around the world taking their first steps in this area. Whilst e-assessment has always been an option in Learning Management Systems, formalized testing at national scale is a relatively new phenomenon. **(Mikelloydtech, 2012).**

On the other hand, Open and Distance Learning (ODL) institutions have been using Computer Assisted Assessment (CAA) systems and software since 1990s as stand-alone assessment systems **(Osuji, 2012).** The UK Open University (OU) has been using Moodle for diagnostic and formative e-Assessment since 2005 and for summative assessment since 2008. Since then, OU has been contributing to and developing Moodle quiz module, question types and other plugins that are created and

maintained by the OU to improve the learning and assessment experience of students **(Koneru, 2017)**

Advantages and benefits of e-assessment:

A lot of advantages and benefits of e-assessment have been recorded (**Jisc (2010). Mikelloydtech (2012)** summarized a number or drivers behind the move towards e-examination. **Koneru (2017)** specified that e-Assessment offers several benefits to ODL institutions and addresses various challenges encountered in administering assessments. **CEA (2018)** listed a number of benefits of e-assessment. On the other hand, **Ogini (2018)** summarized some advantages of CBT over paper-based tests (PBT).

Challenges to e-assessments:

Despite all the benefits and advantages of e-assessment there still some challenges to it. One major challenge to CBA is the forensic readiness. Although digital forensic investigations are commonly employed as a post-event response to a serious information security or criminal incident **(Rowlingson, 2004),** when forensics is used to its potential, it can provide both pre- and post-event benefits **(Armstrong, 2002).** If an Academic institution is not forensically ready, then the necessary evidence, either exists, and hopefully is found by the digital forensic investigation, or it does not exist at all and a suspect (learner) cannot be charged and prosecuted **(Rowlingson, 2004).** An Academic institution could follow the ten steps proposed by **Rowlingson (2004)** in implementing a forensic readiness programme **(Laubscher et al., 2005).**

Abu-Bakr and Adebayo (2014) sought to identify the prospects and challenges that would pose threats to the success of adopting computer- based testing (CBT) in all examinations in Nigeria and how to neutralize them. The study found that the adoption of CBT in Nigeria faces ten critical challenges amongst them are economic factor,

security, Software; Poor ICT culture, policy and implementation; and power failure.

Ogini, (2018) mentioned some challenges to CBT such as the high initial cost of setup, the high cost of ICT equipment, the high cost of internet bandwidth in the third world countries, computers insufficiency, the low level of computer literacy and the poor technical assistance.

As to Egypt, the Egyptian government identified ICT as a national development priority in 1999, and the country aspires to become a regional and international ICT provider **(Hassanin, 2003).**

Education sector in general and universities in particular reflect the level of ICT adoption, implementation and utilization in any country. The exponential speed in ICT developments poses huge challenges and the future of universities will depend as never before on whether they embrace digital technologies.

Universities around the world are rapidly and competitively introducing ICT into all aspects of their core business. ICT provides universities with unprecedented and extraordinary opportunities in the fields of teaching & learning, management and assessment. E-learning and e-assessment are major fields in which ICT is invested. However, before we can implement e-learning as a whole or e- assessment in particular the issue of readiness should be tackled; otherwise it may end up with a complete failure.

El-Shenawi (2005) observed that, in spite of the efforts of the Egyptian MOHE to integrate technology into the education system, results are far behind what was intended. This has been attributed to several factors.

High-stakes computer-based testing (CBT) is growing all over the world. It has developed from computer-based formative assessment practices which are already well established across universities. For example, **Norway** –

with over 800,000 school-age students – was the first country to implement national level e-assessment. As part of a national programme for improving education, and after successful trials in 2009 where students took examinations on their laptops, all the national tests for Reading, English and Math are now digital. A large part of Norway's exams is also conducted digitally. Another country that has implemented a national level e-examination system is **Georgia**, in Eastern Europe. school graduation exams are now delivered through a Computer Adaptive Testing (CAT) system. Last year, 50,000 schoolchildren took the school-leaving exams in 8 subjects in 1520 public and private schools within an eight-day-long timeframe. The solution was developed by an agency of the MoE's National Examinations Center **(Mikelloydtech, 2012).**

In his study, **Hussein (2010)** measured the staff member's e-readiness for e-learning in general at Faculties of Tourism and Hotels in Fayoum, Menia, Alex. and Helwan. Results have showed that there is a shortage and insufficient e-readiness for staff member in technical skills at these Faculties. So, the study recommends that for effective e-learning, the staff member have to improve their technical skills to meet the requirements of e-learning system.

Parsazadeh et al. (2013) reviewed the success factors and identified the most important technological aspects of e-learning. They reported that E-learning as a network of sharing knowledge has changed dramatically the traditional concept of learning. To develop and implement a successful e-learning system, it is vital that institutions recognize the success factors of e-learning systems.

The Joint Admissions and Matriculation Board (JAMB), the sole agency mandated to conduct entrance examinations for universities in Nigeria, has held its first

CBT for more than 1.4 million candidates at some 400 ICT centers countrywide. The new online exam is a revolutionary departure from the paper-pencil test and dual-based test of before. Of course, the innovation was introduced with some glitches as well as advantages, but Nigerians have by and large accepted the computer-based exam (**Fatunde, 2015)**.

In the UK, **Walker et al. (2016)** reported that 10 out of the 110 institutions surveyed have implemented multiple choice summative tests for over 50% of their courses.

Readiness for e-assessment

E- assessment may be a part of e-learning system or a standalone solution. As both e-learning and e-assessment require access to such technologies as computers and networks together with the required skills and attitudes, readiness for e-learning may partially involve readiness for e-assessment. Still, there are some dimensions of readiness that are peculiar to e-assessment such as content (e.g. item banks), commitment (e.g. place, time, feedback) academic dishonesty (e.g. cheating and plagiarism) and tight cyber-security.

E-learning readiness can be defined as "*the mental or physical preparedness of an organization for some e-learning experience or action*" **(Borotis & Poulymenakou, 2004),** the assessment of how ready an institution is to adopt and implement e-learning **(Bowles, 2004)** or "those factors that must be accomplished before e-learning implementation can be regarded as being successful" **(Odunaike et al., 2013).** Similarly, e-assessment readiness can be defined in a slightly different way as "*the physical or mental preparedness of an organization for adopting, implementing and* sustaining *e-assessment."*

How to assess e-assessment readiness:

An evaluation based on objective criteria to establish basic ICT benchmarks is one way of assessing e-readiness. This involves considering whether the necessary infrastructure is in place, but also looking beyond that to whether ICT is accessible to those who need to use it and whether there is an appropriate policy, legal and regulatory framework to support its use. A variety of assessment tools have been developed to measure e-readiness, and assessments have been conducted in many countries. The assessments are diverse in their goals, strategies and results. Choosing the right tool depends on your goal. As a user you should choose a tool that measures what you are looking for against a standard that fits your view of what being 'e-ready' means (**African Education Knowledge Warehouse (AEKW), 2018).**

E- Learning and e-assessment stakeholders and Critical success factors:

Wagner et al. (2008) discussed the e-learning stakeholders and proposed a Stakeholders' Responsibility Matrix. The various stakeholders in higher education e-learning interact with one another in a variety of ways. The success of e-learning is thus dependent on the cooperation of all of those stakeholder groups. Likewise, a similar matrix can be proposed for e-readiness stakeholders.

Through extensive research, **Peslak (2003)** formulated six Key Success factors (KSF) of e-learning: variety, communication, technology, empathy, clarity and content. **Beckstrom et al. (2004)** carried out an assessment of e-learning readiness in Egypt across the following dimensions: Technology and infrastructure, Content and content management, Social (sociological, cultural and psychological), Legal and Economic. They also specified eight critical success factors that were identified as being

integral to the future of eLearning in Egypt. Those included: shared vision, leadership support, technology/infrastructure, content availability, acceptance/embracing of e-learning by stakeholders, economically funded and/or affordable, regulatory environment supportive and legal systems protective of e-learning processes and sustainability. They finally concluded that: to answer the initial question – Is Egypt ready for large-scale e-learning deployment? The answer is a qualified "yes" – e-learning is sorely needed, it's coming, and Egypt can prepare itself to make it easy and effective, or hard and inefficient **(Beckstrom et al. 2004).**

Darab and Montazer (2011) proposed a model for assessing e-learning readiness in higher education in Iran. Their model includes policy, networks, equipment, management, standards, content, regulations, financial and human resource sources, culture and security.

In an attempt to understand whether different stakeholders in HEIs tend to embrace or ostracize e-learning for their work, the study of **Akaslan and Law (2011a)** investigated the extent to which the HEIs associated with the science of electricity in Turkey were ready for e-learning. It also examined two factors that presumably affect the perceptions of academic staff of e-learning: first, the degree to which teachers believe that e-learning would be free of effort and would enhance their teaching; second, whether teachers need training on e-learning before embarking on it.

To address these issues, a web-based survey was distributed to 417 programs in 360 HEIs in Turkey. More than 1206 active academic staff were invited to participate in the survey with 289 answering all the questions and 53 some of them. Descriptive and inferential statistics were computed. Overall, the findings indicate that the academic

staff in the HEI associated with the subject of electricity in Turkey generally show positive experiences, confidences and attitudes towards e-learning. In spite of the fact that their readiness seems to be sufficient, their attitudes towards e-learning must be strengthened in order to facilitate effective adoption of e-learning (**Akaslan and Law, 2011a)**.

In turkey, e-learning readiness of the academic staff of Hacettepe University Faculty of Letters (HUFL) is investigated. A 37-item questionnaire along with some demographic questions is used for obtaining the data. Results show that title might be a significant factor for e-learning readiness and in general, HUFL academic staff are not ready for the e-learning environment. The findings of this study will help to conduct a larger study throughout Turkey in order to determine a model for course of action for transition to an e-learning system (**Soydal et al., 2011)**

The study of **Patrick (2012)** clearly defined e-learning and addressed its problems and barriers. It pointed out that lack of training and technology provided hindered the establishment of an effective form of e-learning in education. Before governments and schools can establish a successful mode of e-learning in education, an understanding of the key success factors (KSF) needs to be possessed. From the literature review, in-depth interviews and questionnaire, the researcher was able to develop a model that evaluates and supports e-learning. It follows that the dominating factors of successful e-learning that emerged from this study are: (1) technology, (2) human, (3) design, (4) support, and (5) evaluation.

In an attempt to specify the Critical Success Factors (CSFs) for Online Distance Learning (ODL) in Higher Education (HE), **Cheawjindakarn1 et al. (2012)** analyzed

and synthesized the literature review. The literatures were reviewed to determine items relevant to online learning success. The results on the CSFs for ODL could be grouped into 5 factors: 1) institutional management, 2) learning environment, 3) instructional design, 4) services support and 5) course evaluation. Each of these 5 factors includes several important elements that can assist to enhance efficiency of online learning in higher education institutions.

Alhomod and Shafi (2013) attempted to identify the success factors of e-learning programs in King Saud University from an engineer and technician's point of view. An extensive study of existing literature was done to determine the 11 success factors of e- learning program. The levels of importance of success factors were determined on the basis of quantitative methods.

Lwoga (2014) examined the factors that predict students' continual usage intention of web-based learning content management systems in Tanzania. He stated that the rapid developments of information and communication technologies specifically Internet technologies have created new opportunities for education. E-learning holds immense potential to enable higher institutions of learning to enhance teaching and learning experiences, improve access to educational resources and programs, expand educational opportunities via distance-learning, and reduce the costs of education in the long-term.

Yew and Jambulingam (2015) reviewed studies of e-learning implementation and discussed critical success factors to provide some insights for educational institutions embarking on e-learning. They concluded that e-learning implementation process requires detailed and careful planning, execution and maintenance. In order for e-learning to be successfully implemented, key factors such

as infrastructure and environment, attribute of educators, delivery of course contents and change agents ought to be considered and adapted appropriately.

To design a framework on the critical success factors of e-learning implementation in Higher Education, **Basak et al. (2016)** made a systematic review of a total of 57 articles. The proposed conceptual framework was designed by compiling critical success factors from 28 articles. It was based on eight domains of factors, each of them has subfactors: technological, institutional, pedagogical, management, ethical, evaluation, resources and the social interaction factors. They concluded that this emerging conceptual framework is crucial in developing instructional programs to improve e-learning implementation in higher education. New studies, however, are required, first, to explore other critical factors like the perception of the valence or usefulness of the planned training ("valence") and of its feasibility ("expectancy"), but also to decipher the interrelation between the factors noted above and to take into account the diverse national infrastructural technological context.

In an attempt to explore the gaps in knowledge regarding the technological aspects of e-learning readiness. **Mosa et al. (2016)** presented a review of the models and frameworks for assessing e-learning readiness. The review showed that there is a lack of investigation and agreement about the factors that shape the technological aspects of e-learning readiness. The authors concluded that future research will be conducted to generate a list of the factors shaping the technological aspects of e-learning readiness. This list will help HEIs to identify and understand the technological aspects that must be considered when assessing the readiness to adopt e- earning. In addition, the list of technological readiness factors can be used by

designers and developers as a guideline for identifying the necessary technological requirements for e-learning implementation (**Mosa et al., 2016). discussion**

Although this review is highly useful, some aspects are deceitfully overlapping such as the aspects of infrastructure, hardware, and computers. In addition, the importance of every aspect which is referred to as "frequency" may be misleading, too as this varies a lot from one context to another. Nevertheless, the review will help as guidance when assessing the readiness for both e-learning and/ or e-assessment. **Discussion**

RESEARCH METHODOLOGY

The present study aims at assessing to what extent the faculty members/academics at Cairo University are technically prepared for the implementation of Computer-Based Assessment (CBA) of students Performance.

Research population

The research population included the faculty members/academics of Cairo University, Giza, Egypt.

Research limitations

The research was limited to the academics at only three faculties at Cairo university, namely the faculty of Agriculture (Agri), the faculty of Physio-Therapy (PT) and the faculty of Dar el-Olum (Dar). The research had been done by the end of the second semester of the academic year (2017/2018).

Research sample

Stratified random samples were drawn from the three faculties. The overall research sample was 307 academics representing all the academic degrees (31 demonstrators, 78 assistant lecturers, 68 lecturers, 55 assistant professors, 38 professors, 37 emeritus professors).

Research instrument

After reviewing a number of published instruments in this context, and from our experience, a reasonably explicit instrument (5-point Likert scale questionnaire) was used to gather the academics' responses with five ordered choices ranging from 1 being "strongly disagree", 2 "disagree", 3 "neutral", 4 "agree", and 5 "strongly agree".

The questionnaire consisted of 45 items distributed to two sections: section A (4 items) which included the basic data and an initial item and section B (41 items) which included six constructs of readiness. Descriptions of constructs, distribution of items and measuring scale are shown in table 1.

Table 1: Descriptions of constructs, items and measuring scale of the academics' questionnaire

Section	Domain	Construct	Explanation	Scale	Items	No of items
A	**Basic data**	Basic data	Faculty, academic degree, gender	-	-	3
	Initial item	Daily hours on the Internet	How much time does a faculty member stay online every day?	3-point Likert scale	-	1
B	**Readiness for CBA (R)**	Personal access to technology (R1)	Having a smart device, laptop or PC together with Internet access	Yes/No	1-6	6
		Experience in CBA (R2)	Having back experience in CBA	Yes/No	7-16	10
		Basic computer	Skills of using	5-point Likert	17-26	10

Section	Domain	Construct	Explanation	Scale	Items	No of items
		& software skills (BCSS, R3)	computer and digital files	scale		
		Internet skills and usage (ISU, R4)	Skills of using the Internet	5-point Likert scale	27-33	7
		CBA skills (CBA, R5)	Knowledge & Skills of CBA	5-point Likert scale	34-41	8
		Readiness of content (R6)	How much ready is the CBA content?	5-point Likert scale	42-47	6

Procedure

Instrument administration

The research questionnaire was administered to the respondents during the second semester of the academic year 2017/2018. The forms were delivered to the academics in their offices. A short briefing regarding the purpose of the study and how to complete the form was given. After being completed, the forms were collected, counted and checked and the abused forms were excluded. Afterward, Data were recorded in excel worksheets (MS Excel, 2016) and then exported to IBM Statistical Package for Social Sciences (SPSS, V24) for descriptive and inferential statistical analysis.

Instrument validation

The proposed questionnaire was first examined for validity by an expert jury and their suggestions and amendments were taken into consideration. To statistically guarantee the validity and reliability of the instrument, the revised questionnaire was applied to a pilot group of academics (74 academics) that represented the research

population. After completing the forms, data were collected and statistically analyzed for normality, validity and reliability.

1. **Test of Normality:**

The pilot sample data were examined for normality and the results revealed that the data of the constructs were not normally distributed.

2. **Validity:**

The validity was statistically checked by examining both the internal consistency coefficient between each item and its corresponding construct and the construct- domain validity. Spearman correlation coefficients (2-tailed) were significant at the 0.01 level. Item- construct correlation coefficients were positive and ranged from average (0.482**) to strong (0.878**) and construct-domain coefficients ranged from average (0.460**) to strong (0.844**). Therefore, the internal consistency and construct validity of the questionnaire in its revised form were satisfactory and encouraging to proceed the actual study on the research population.

3. **Reliability:**

Questionnaire reliability was measured by checking the internal consistency coefficient which refers to the general agreement between the items and their corresponding construct. The item-construct Cronbach's alpha coefficients ranged from fair (0.790) to excellent (0.947) and there was no need to delete any item. On the other hand, the construct- domain Cronbach's alpha coefficient was fair (0.781). Thus, the questionnaire was reliable and encouraging to proceed the actual study on the research population.

Judgement of Readiness

According to **Aydin & Tasci (2005) and Akaslan & Law (2011 a)** assessment models, the mean score (3.41) is

treated as the minimum acceptable level of readiness. To make the judgement process fast, clear and visually indicative, we proposed a colourful (ROYG) scale. The colors could be used as visual indicator of readiness level of a given item, construct, domain or even an institution (Table 2 and Figure 1).

Table 2: Judgement scale for 5-point Likert scale questionnaire

Category	Range	Readiness	Action required	Comment	Symbol	Proposed Color
1	1 - 2.6	Not ready	Work hard	Needs a lot of work	NRwh	Red
2	>2.6 - 3.4	Not ready	Work	Needs some work	NRw	Orange
3	>3.4 - 4.2	Ready	Improve	Needs some improvement	Ri	Yellow
4	>4.2 - 5	Ready	Go	Go ahead	Rg	Green

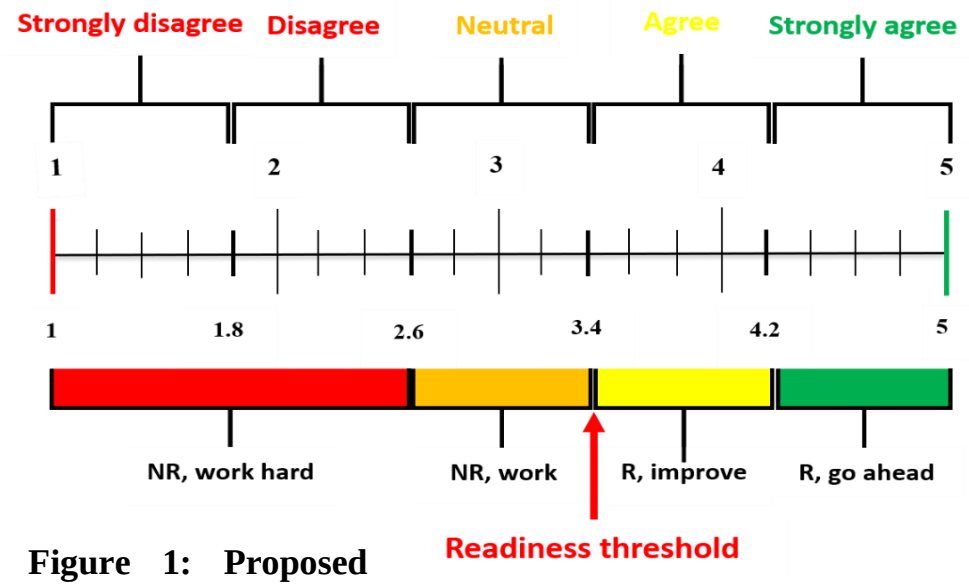

Figure 1: Proposed Judgement scale for 5-point Likert scale questionnaires

RESULTS & DISCUSSION

As previously stated, the present study attempted to answer one major research question: Are the Faculty members at CU ready for CBA implementation? that is subdivided into nine minor questions. The answers to these questions are presented and discussed below

- **Faculty's daily hours on the Internet**

Stimulatingly, the Faculty members were first asked about the average period (in hours) they spend surfing the Internet every day. As shown in Table 3, majority (66.4%) of them spend more than 2 hours online every day, while 32.2% spend less than 2 hours and only 1.3% don't go online. These data revealed that the majority of Faculty members are so familiar with the Internet that it has become a daily routine for them. Nevertheless, they are still giving traditional paper exams. No doubt, we should make the best use of this familiarity at the level of their academic performance. In fact, the integration of ICT in education has revolutionalised and transformed the education sector worldwide and created positive impacts **(Bhuasiri et al., 2012).**

Table 3: Faculty's daily hours on the Internet

Item No.	Item	Response	Frequency	Percent
1.	Average daily hours on the internet عدد الساعات متوسط اليومية على شبكة الإنترنت	none	4	1.3
		less than 2 hours	99	32.2
		greater than or equals 2 hours	204	66.4
		Total	307	100.0

1. **Do Faculty members have personal access to technology (PAT, R1)?**

This construct consisted of six items and reflected- on Yes/No scale- the Faculty members' personal possession

of the technological tools needed for CBA. Their responses are shown in table 4.

Table 4: Faculty members' personal access to technology

Item No.	Item	Response	Frequency	Percent
	هل لديك تليفون محمول ذكي (تليفون أو تابلت أو آي باد)؟ Do you have a smart device (mobile phone/tablet/ I pad…etc.?	No	14	4.6
		Yes	293	95.4
	هل لديك باقة إنترنت على التليفون أو التابلت أو الآي باد؟ Do you have Internet package on your smart device?	No	65	21.2
		Yes	242	78.8
	هل لديك لاب توب أو حاسب آلي خاص؟ Do you have a lap-top or a PC?	No	22	7.2
		Yes	285	92.8
	هل لديك خدمة إنترنت منزلية جيدة ؟ Do you have an Internet package at home?	No	46	15.0
		Yes	261	85.0
	هل لديك بريد إلكتروني خاص؟ Do you have a personal e-mail address?	No	4	1.3
		Yes	303	98.7
	هل لديك بريد إلكتروني أكاديمي (على موقع الكلية أو الجامعة) مفعل ؟ Do you have an active academic e-mail?	No	60	19.5
		Yes	247	80.5

As shown in table 4, high majority (95.4%) of the Faculty members possess a smart device and 78.8% of them have access to the internet through their devices. On the other hand, 92.8% of the Faculty members possess a laptop and /or a personal computer and 85.0% have an internet package at home. Interestingly, while 98.7% of Faculty members have a personal e-mail, only 80.5% have an active academic one.

Overall, at the personal level, the faculty members have a proper access to technology. This 24/7 access should be exploited well in their academic career through providing e-learning and e-assessment solutions for their students. On the other hand, the percentage of active academic e-mails (80.5%) is insufficient as the academic e-mail has to be the official communication channel. These results are fully consistent with those of **Yew & Jambulingam (2015)** who stated that this easy access to electronic media, thanks to the availability of electronic devices such as laptops, tablets and smartphones has prompted many educational institutions around the world to adapt to the current lifestyle of learners, by switching teaching and learning methodologies from traditional classroom set-ups to those that embrace electronic formats. As a result, e-learning has become the buzzword in many educational institutions.

2. Do Faculty members have experience in CBA (ECBA, R2)?

This construct consisted of ten items and reflected- on a Yes/No scale- the Faculty members' experience in CBA. Their responses are shown in Table 4.

It is generally obvious that the majority of Faculty members lack the experience needed for CBA. Only 34.2% had studied e-course, only 46.6% had ever taken a CBA while very low percentages had ever been trained on LMS's (17.9), item banking (11.4) or CBA management software (10.4). Therefore, intensive training on the CBA-related knowledge and skills is crucially required. Skills at dealing with essential software should be enhanced.

Table 5: The faculty members' experience in CBA

Item No.	Item	Response	Frequency	Percent
1.	هل سبق لك دراسة بعض المقررات الإلكترونية؟ Have you ever studied e-courses?	No	202	65.8
2.		Yes	105	34.2
3.	هل سبق لك تدريس بعض المقررات الإلكترونية؟ Have you ever given an e-course?	No	241	78.5
4.		Yes	66	21.5
5.	هل سبق لك أداء بعض الاختبارات الإلكترونية (على الحاسب أو عبر الإنترنت)؟ Have you ever taken a CBA?	No	164	53.4
6.		Yes	143	46.6
7.	هل سبق لك نشر اختبار إلكتروني (على الحاسب أو عبر الإنترنت) للطلاب؟ Have you ever published an online or a computer-based exam to your students?	No	257	83.7
8.		Yes	50	16.3
9.	هل أعددت أو شاركت في إعداد مستودع أوبنك للأسئلة خاص بمقررك أو بمقررات أخرى؟ Have you ever participated in preparing an item pool or bank?	No	82	26.7
10.		Yes	225	73.3
11.	هل سبق لك التدرب على كيفية إعداد البنود الاختبارية (الأسئلة)؟ Have you ever been trained on preparing test items?	No	126	41.0
12.		Yes	181	59.0
13.	هل سبق لك التدرب على التحليل الإحصائي والسيكومتري للاختبارات والبنود الاختبارية؟ Have you ever been trained on statistical and psychometric analysis of tests or items?	No	250	81.4
14.		Yes	57	18.6
15.	هل سبق لك التدرب على برمجيات إدارة التعلم الإلكتروني (مثل موودل وبلاك بورد) Have you ever been trained on an LMS (like MOODLE, Blackboard … etc.)	No	252	82.1
16.		Yes	55	17.9
17.	هل سبق لك التدرب على برمجيات إدارة بنوك الأسئلة؟ Have you ever been trained on item banking software?	No	272	88.6
18.		Yes	35	11.4
19.	هل سبق لك التدرب على برمجيات إدارة	No	275	89.6

Item No.	Item	Response	Frequency	Percent
	الاختبارات الإلكترونية؟ Have you ever been trained on CBA management software?	Yes	32	10.4

3. Do the Faculty members have the basic computer skills (BCS) needed for CBA (R3)?

This construct consisted of ten items and reflected- on a five-point Likert scale- the Faculty members' awareness of or familiarity with smart devices, operating systems and the basic software which deal with digital files (text, ppt, spreadsheets, pdf, image, audio, video). This familiarity is a basic requirement for dealing with CBA. To test for the significance of differences between these items, Friedman test was used.

Table 6 shows the mean, standard deviation and the mean rank of each item together with Friedman statistics. As shown, there is a significant difference ($P<0.05$) among the items. Item 18 was the highest (4.15) and item 27 was the lowest (2.48). As will be discussed downwards, the overall mean of BCS was 3.57.

Table 6: The faculty members' basic computer skills (BCS)

Item No.	Item	Mean	S.D.	Mean Rank*
18	أجيد التعامل مع الحاسب الآلي وبرمجيات التشغيل (مثل ويندوز وأندرويد) I am good at dealing with the PC and the operating systems (like Windows and Android).	4.15	1.065	7.07
19	أقوم بنفسي بتنزيل وتهيئة (تنصيب) البرمجيات والتطبيقات التي أحتاج إليها I can download and install the needed software.	3.68	1.412	5.86
20	أستطيع التعامل مع المشكلات الفنية البسيطة للحاسب I can deal with the simple technical problems of the computer.	3.49	1.370	5.15

21	أجيد التعامل مع برمجيات تحرير النصوص (مثل ميكروسوفت وورد) I'm good at dealing with text editing software (like Microsoft Word)	4.12	1.206	7.02
22	أجيد التعامل مع برمجيات تقديم العروض (مثل ميكروسوفت باور بوينت) I'm good at dealing with presentation software (like Microsoft PowerPoint)	3.95	1.276	6.57
23	أجيد التعامل مع برمجيات تحرير الجداول والرسوم البيانية (مثل ميكروسوفت إكسل) I'm good at dealing with spreadsheet editing software (like Microsoft Excel)	3.29	1.413	4.69
24	أجيد التعامل مع برمجيات عرض وتحرير الملفات الرقمية الأخرى (مثل بي دي إف) I'm good at dealing with the software that view and edit other digital files (like PDF)	3.85	1.238	6.24
25	جيد التعامل مع برمجيات عرض وتحرير الصور (مثل الرسام ...) I'm good at dealing with the software that view and edit images (like Painter)	3.17	1.334	4.40
26	أجيد التعامل مع برمجيات تشغيل الصوت والفيديو (مثل مديا بلاير....) I'm good at dealing with the audio and video playback software (like Media Player ....)	3.47	1.331	5.16
27	أجيد التعامل مع برمجيات تحرير الصوت والفيديو (مثل أوداسيتي وموفي ميكر ....) 'm good at dealing with the audio and video editing software (like audacity and movie maker....)	2.48	1.406	2.85
R3	Overall mean	3.57	1.074	-

*Friedman Test statistics	
N	٣٠٧
Chi-Square	810.534
df	٩
Asymp. Sig.	.000

4. Do Faculty members have the basic Internet skills (BIS) needed for CBA (R4)?

This construct, which consisted of seven items, reflected- on a five-point Likert scale the Faculty members' skills at using the internet, thus being able to

manage an online CBA. Table 7 shows the mean, standard deviation and the mean rank of each item together with Friedman statistics. As shown, there is a significant difference (P<0.05) among the items. Item ٣٤ was the highest (4.44) and item ٣٢ was the lowest (3.07). The overall mean of BIS was 4.05.

Table 7: The faculty members' basic internet skills (BIS)

Item No.	Item	Mean	S.D.	Mean Rank
28	أجيد التعامل مع برمجيات تصفح الإنترنت ومحركات البحث (مثل جوجل كروم) I'm good at dealing with the web browsing software and search engines (like Google Chrome)	4.24	1.017	4.30
29	أجيد التعامل مع البريد الإلكتروني I'm good at e-mailing	4.40	.963	4.68
30	أستطيع الوصول إلى المساعدة والدعم الفني عبر الإنترنت عندما تواجهني مشكلة I can access online help and support when I have a problem	3.43	1.318	2.75
31	أستخدم الإنترنت في الحصول على المعلومات ومتابعة الأخبار I use the Internet to get information and follow news	4.39	.853	4.54
32	أستخدم الإنترنت في الحصول على الخدمات (دفع الفواتير- الحجز- التسوق- البنوك ...) I use the Internet to access services (bill payment, booking, shopping, banking ...)	3.07	1.516	2.50
33	أستخدم الإنترنت في التواصل مع معارفي (زملائي- أصدقائي- تلاميذي- أقاربي ...) I use the Internet to communicate with my acquaintances (my colleagues - my friends - my students - my relatives ...)	4.39	.858	4.52
34	أستخدم الإنترنت في مجال دراساتي وابحاثي (بريد إلكتروني- تواصل- بحث- نشر- تدريس ....) I use the Internet in my studies and research (e-mailing, doing research, publishing, teaching ...)	4.44	.893	4.70
R4	**Overall mean**	**4.05**	**.804**	**-**

Item No.	Item	Mean	S.D.	Mean Rank
Friedman Test statistics				
N	307			
Chi-Square	601.346			
df	6			
Asymp. Sig.	.000			

5. Do Faculty members have the basic CBA skills (CBAS, R5)?

This construct consisted of eight items and reflected-on five-point Likert scale Faculty members' skills at dealing with CBA. Table 8 shows the mean, standard deviation and the mean rank of each item together with Friedman statistics. As shown, there is a significant difference ($P<0.05$) among the items. Item 38 was the highest (3.69) and item 42 was the lowest (2.06). In general, Faculty members lacked the CBA skills. The overall mean of CBAS was very low (2.46). Again, intensive training should be provided to develop these skills.

Table 8: The faculty members' basic CBA skills (CBAS)

Item No.	Item	Mean	S.D.	Mean Rank
35	أعرف جيدا ما المقصود بالتقويم الإلكتروني e- assessment I know very well what e-assessment is.	2.62	1.373	4.95
36	لدي دراية كافية عن نظم الاختبارات الإلكترونية (الحاسوبية- عبر الإنترنت- التكيفية) I have sufficient knowledge of e-assessment systems (CBA-online-adaptive)	2.32	1.166	4.25
37	لدي دراية كافية عن نظم بنوك الأسئلة الإلكترونية ((Electronic item banks I have sufficient knowledge of e-item banks.	2.35	1.137	4.33
38	أجيد بناء مفردات اختبارية (أسئلة) متنوعة وجيدة في مجال تخصصي I am good at constructing a variety of good test items in my field.	3.69	1.185	6.71

39	أجيد تشغيل وإدارة برمجيات التعلم الإلكتروني I am good at operating e-learning software.	2.31	1.233	4.25
40	أجيد تشغيل وإدارة برمجيات بنوك الأسئلة I am good at operating item banks software.	2.18	1.175	3.96
41	أجيد إعداد وتحرير ونشر اختبارات إلكترونية (حاسوبية- عبر الإنترنت) للطلاب I am good at preparing, editing and publishing online or computer-based tests for students.	2.20	1.245	3.92
42	أجيد تشغيل وإدارة برمجيات الاختبارات الإلكترونية I am good at operating e-assessment software.	2.06	1.167	3.62
R5	**Overall mean**	**2.46**	**.976**	**-**

Friedman Test statistics	
N	**307**
Chi-Square	**558.840**
df	**7**
Asymp. Sig.	**.000**

6. Is CBA content ready? (CBAC, R6)?

This construct, which consisted of six items, reflected- on a five-point Likert scale the readiness of CBA test items for CBA implementation. Table 9 shows the mean, standard deviation and the mean rank of each item together with Friedman statistics. As shown, there is a significant difference ($P<0.05$) among the items. Item 45 was the highest (3.23) and item 48 was the lowest (2.20). The overall mean of CBAC was very low (2.83). Therefore, as realized by the faculty members, the CBA content, in terms of test items, is not ready.

To adopt CBA, test items in all subjects should be constructed in the light of testing theories such as the item response theory (IRT). The faculty members should be trained on how to construct a diversity of good test items that reflect the course ILO's. These items should be revised well by subject matter experts (SME) and assessment experts. Afterwards, the items should be piloted during real examinations to do the relevant psychometric analysis. After piloting, the bad items are

discarded and the good ones should be kept, together with their metadata, in an item bank. In fact, an intensive effort should be exerted to achieve all of these tasks and the academics should take their responsibilities in this context.

Table 9: The readiness of CBA content (CBAC)

Item No.	Item	Mean	S.D.	Mean Rank*
43	المقررات الدراسية معالجة تربويا وموصفة توصيفا كاملا Courses are fully educational and fully specified	3.09	1.216	3.88
44	للمقررات جاهزة لاشتقاق ILO's نواتج التعلم المستهدفة البنود الاختبارية منها The intended learning outcomes (ILO's) are ready to derive test items from	3.08	1.229	3.82
45	يوجد مستودع أسئلة ورقي شامل خاص بمقرراتك There is a comprehensive paper item pool for your courses	3.23	1.371	4.14
46	يوجد مستودع أسئلة رقمي (إلكتروني) شامل خاص بمقرراتك There is a comprehensive digital item pool for your courses	2.59	1.417	3.15
47	يوجد بنك أسئلة مقنن ومدرج ورقي شامل خاص بمقرراتك There is a comprehensive paper item bank for your courses	2.81	1.346	3.43
48	يوجد بنك أسئلة مقنن ومدرج رقمي (إلكتروني) شامل خاص بمقرراتك There is a comprehensive digital item bank for your courses	2.20	1.326	2.58
R6	**Overall mean**	2.83	.965	-

***Friedman Test statistics**	
N	307
Chi-Square	210.540
df	5
Asymp. Sig	.000

Faculty members' overall readiness for CBA implementation:

After exploring the faculty members' readiness constructs separately, the obtained data were judged. The number of items, mean, standard deviation, percent and the mean rank of each construct (R3, R4, R5 and R6)

together with Friedman statistics are summarized in table 10. Pairwise comparisons of readiness constructs using Freidman post- hoc test are also shown in table 11.

Table 10: Statistics of faculty members' responses to technical readiness constructs.

Construct	No. of items	Mean	S.D.	Mean Rank*	%	R	Color
R3. Basic computer skills, (BCS)	10	3.57	1.074	2.78	71.40	Ri	Y
R4. Basic internet skills, (BIS)	7	4.05	.804	3.62	81.00	Ri	Y
R5. CBA skills, (CBAS)	8	2.46	.976	1.53	49.20	NRwh	R
R6. CBA Content (CBAC)	6	2.83	.965	2.07	56.60	NRw	O
R. Overall readiness, (R)	31	3.23	.741	-	64.60	NRw	O

***Friedman Test statistic**	
N	307
Chi-Square	462.435
df	3
Asymp. Sig.	.000

As shown in tables 10 & 11, Friedman test and its post hoc test revealed that there is a significant difference ($P<0.05$) between each pair of the four constructs of readiness. The basic internet skills (R4, 4.05) of the faculty members is higher than the basic computer skills (R3, 3.57) that is higher than the CBA content (R6, 2.83)

that is higher than the CBA Skills (R5, 2.46). The overall mean of readiness was 3.23.

Table 11: pairwise comparison of readiness constructs using Freidman test and its post- hoc test.

Constructs	Test statistic	Std. Error	Std. test statistic	Sig.	Adj. Sig.	Decision
R5- R6	-.544	.104	-5.220	000	000	Reject
R5- R3	1.248	.104	11.973	000	000	Reject
R5- R4	2.091	.104	20.069	000	000	Reject
R6-R3	.704	.104	6.752	000	000	Reject
R6-R4	1.547	.104	14.849	000	000	Reject
R3-R4	-.844	.104	-8.096	000	000	Reject

- Each row tests the null hypothesis that the pair distributions are the same.
- Asymptotic significances (2-sided tests) are displayed. The significance level is 0.05.
- Significance values have been adjusted by the Bonferroni correction for multiple tests.

As shown in table 10 and figure 2, on comparing the obtained value of each construct with the readiness threshold (3.40) we find that the basic computer skills (BCS) and the basic internet skills (BIS) of the faculty members are rather satisfactory (3.57 & 4.05, respectively). However, the two constructs still need further improvement (Ri, yellow) particularly the BCS. On the other hand, both CBA skills and CBA content are not ready yet. The obtained values were 2.46 and 2.83, respectively. While the former needs hard work (NRwh, Red), the latter needs some work (NRw, orange). As regarding the overall technical readiness (R), the faculty members are not ready so far. The obtained value was 3.23 which is corresponding to (NRw) i.e., not ready (NRw, orange) because some work is still needed.

Assessment is a very sensitive and critical component of any curriculum. Several decisions are usually taken according to the results of assessments, whether they are initial, formative or summative, high stake or low stake. Therefore, shifting from the traditional assessment to the electronic one can't be left to the procedure of trial and error. Otherwise, it may result in devastating consequences. Assessing e-assessment readiness is the first step in any approach to introducing e-assessment tools or system to any institution. Before we can implement e-learning as a whole or e- assessment as a standalone solution, the issue of readiness should be tackled as it tells us how much the institution is ready in terms of preparedness, skillfulness, willingness and promptness for adopting, implementing, utilizing and sustaining e-assessment. It can also be used as an information-gathering mechanism to help devise plans and formulate strategies for ICT integration into assessment.

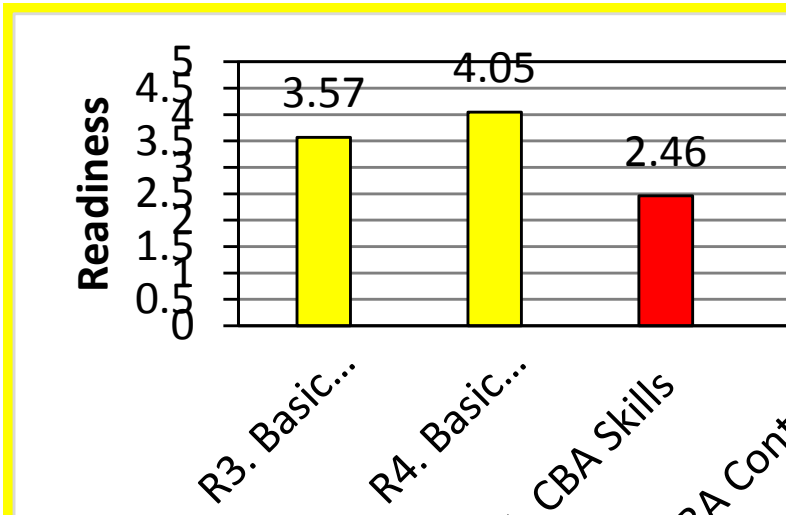

Figure 2: Faculty members' technical readiness for CBA

7. Is there a difference between colleges in readiness for CBA?

This question attempts to explore the differences in the faculty members' technical readiness for CBA that depend on the college category. Statistics of Kruskal Wallis test of different constructs grouped by colleges are shown in table 12.

Table 12: Kruskal Wallis Test statistics of technical readiness grouped by colleges.

Construct	College	N	Mean	S.D.	Mean Rank	Chi-Square	Sig.	Decision
Technical Readiness (R)	Agri	135	3.36	.752	170.51	13.386	.001	Reject
	PT	95	3.24	.694	154.74			
	Dar	77	2.98	.723	124.14			

Table 13: Kruskal Wallis post- hoc pairwise comparison Test statistics of technical readiness grouped by college

Construct	Pair	Test statistic	Std. Error	Std. test statistic	Sig.	Adj. Sig.	Decision
Technical Readiness (R)	Dar-Agri	46.365	12.677	3.657	.000	.001	Reject
	Dar-PT	30.599	13.612	2.248	.025	.074	Retain
	Agri-PT	15.765	11.887	1.326	.185	.554	Retain

As presented in table 12 & 13, there is a significant difference among the three colleges in favour of the practical colleges (Agri & PT) in technical readiness. However, the difference between Agri and PT is insignificant ($p < .05$). The mean values were 3.36 (NRw, orange) and 3.24 (NRw, orange) for Agri and PT, respectively compared with 2.98 (NRw, orange) for Dar el-Olum. Bearing in mind the set threshold (3.40), the three faculties are still not ready (NRw, orange) for CBA implementation; some work is still required.

The technical readiness is concerned with the knowledge and skills of dealing with CBA. The faculty members may accept CBA but technically they may not be ready for implementation. The recorded significant difference between the practical colleges and Dar el-Olum may be attributed to the faculty members' background and nature of study. Scientific academics are much more involved in information and communication technology (ICT) than the literary ones.

8. Is there a difference among academic degrees in readiness for CBA?

This question explores the difference in technical readiness for a CBA that could be attributed to the academic degree. Kruskal Wallis test statistics for the technical readiness grouped by academic degree are shown in table 14.

Table 14: Kruskal Wallis Test statistics of different domains grouped by academic degree.

Construct	Academic degree	N	Mean	SD	Mean Rank	Chi-Square	df	Sig.	Decision
Technical Readiness	Demonstrator	31	2.9904	.70381	129.15	8.987	5	.110	Retain
	A. Lecturer	78	3.1282	.63830	139.94				
	Lecturer	68	3.3993	.57829	175.23				
	A. Professor	55	3.3322	.73583	163.64				
	Professor	38	3.2403	.90972	154.67				
	Emeritus	37	3.1600	.97588	150.45				

As shown in table 14, there weren't any significant differences (P>0.05) in technical readiness among the academic degrees. These results suggest that the academic degree doesn't affect technical readiness for CBA. It seems that the faculty members develop their IT skills on their own regardless of their academic degree.

9. Is there a difference between genders in technical readiness for CBA?

The differences in the technical readiness for CBA due to gender were explored. Statistics of Mann-Whitney test of the technical readiness grouped by gender are shown in table 15. As shown, there were insignificant differences ($p<0.05$) between males and females in their technical readiness for CBA. Both males (3.26) and females (3.17) are not technically ready (NRw, orange) for CBA. In fact, a lot of training and practice should be provided to both genders to develop their skills at dealing with CBA.

Table 15: Mann-Whitney Test statistics of academics grouped by gender

Construct	Gender	N	Mean	SD	Mean Rank	Mann-Whitney U	Z	df	Sig.	Decision
Technical readiness	Male	193	3.26	.769	158.86	10063.000	-1.248	1	.212	Retain
	Female	114	3.17	.691	145.77					

- **CONCLUSION**

The present study determined the technical readiness of CU academics for the implementation of computer-based assessment (CBA) through surveying five constructs: personal access to technology, experience in CBA, basic computer skills, basic internet skills and basic CBA skills together with CBA content readiness.

Are the faculty members technically ready for CBA implementation?

The study has shown that the faculty members have satisfactory personal access to technology. The majority possess smart devices and have access to the internet. Moreover, their basic internet skills were rather satisfactory and they are so familiar with the internet that it has become a daily routine for them. This access should be exploited well in their academic career by introducing

e-learning and e-assessment solutions to their students. Nevertheless, the majority of them lack the experience needed to deal with CBA. Therefore, intensive training on CBA-related knowledge and skills is crucially required.

On comparing the obtained value of each construct with the readiness threshold (3.40), the faculty members have shown poor CBA skills (2.46, red color), poor content readiness (2.83, orange color), rather satisfactory basic computer skills (3.57, yellow color) and rather satisfactory basic internet skills (4.05, yellow color). As to the overall technical readiness (R), the evidence from this study suggests that the faculty members are not ready so far (3.23, orange color) i.e., not ready and some work is still needed. To be cautious, technical readiness for CBA implementation cannot be claimed unless each construct exceeds the stated threshold.

Is there a difference among academics due to college, academic degree or gender?

The results of this study have also indicated that the faculty members of the practical colleges (Agri & PT) have significantly shown more technical readiness than those of Dar El-Olum. Bearing in mind the set threshold (3.40), the three faculties are still not ready (orange color). For CBA implementation; some work on technical readiness is still required. On the other hand, there weren't any significant differences ($P<0.05$) in technical readiness among academics due to academic degrees or gender.

- **RECOMMENDATIONS**

1. Every academic has to get a valid and active academic e-mail to be officially used for academic communication.
2. Academics must be encouraged to use the technological resources and technical skills at the academic level for introducing e-learning and CBA

solutions. In this context, the BYOD (Bring Your Own Device) approach could be used even as a pilot stage and/or formative assessment until the required infrastructure has been installed at the campus.

3. As faculty members are not technically ready for CBA implementation and showed poor CBA skills and unsatisfactory basic computer skills, hard work has to be done and intensive courses and workshops have to be held to develop these skills, particularly at the theoretical colleges.
4. Hard work should be done by the faculty members so as to develop the CBA content i.e. test items and item banks.
5. A comprehensive plan should be devised to develop the academics' technical skills as regards preparing and implementing CBA.

- **SUGGESTIONS FOR FURTHER STUDIES**

Although the present study has gone some way towards enhancing our understanding of the technical readiness of the academics for CBA, it is recommended that further research should be undertaken in the relevant areas. Preparedness for CBA implementation is a multifactorial phenomenon. Therefore, other factors and stakeholders should be addressed.

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