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A FRAMEWORK FOR THE IMPLEMENTATION OF COMPUTER BASED  
TESTING FOR SAUDI ARABIA SECONDARY SCHOOLS

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*Dedicated to*

*My parents, **Abduh Hakmi** and **Jumah Hakami**,*

*My wife, **Aljalilah Hakami**,*

*All my family and friends for their immeasurable support and love*

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## ABSTRACT

The number of students continually increases along with a growing need for more effective student evaluation and testing methods; trends that present an enormous challenge for teachers and administrators who utilize paper-based methods. The use of Computer Based Testing (CBT) is currently viewed as a viable approach that provides swift and accessible results that more economically and accurately solve problems such as inaccurate test results, delays in exam feedback, and the inadequate scoring methods that attend traditional paper-based methods. The advantages of CBT and the continual increase in Information and Communications Technology (ICT) applications for education in Saudi Arabia prompted the Ministry of Education (MoE) to develop the “Tatweer” CBT system for Saudi Arabia's secondary schools. However, the project failed when implemented due to a lack of foresight that might otherwise have produced clearer protocols for practice. Such guidelines could have been based on required criteria for successful ICT performance if an appropriate study had been undertaken prior to launch. Hence, this effort examined Saudi Arabia's CBT implementation in its secondary school system with a view to clearly stipulate process guidelines based on the integration of specific criteria that affect successful CBT implementation. The framework for the proposed CBT implementation was extracted from six prior studies of CBT implementation efforts involving Joint Application Development (JAD) and twelve CBT experts in Saudi Arabia. The proposed criteria were clearly defined after a survey was conducted with four CBT experts. Validation of the proposed framework involved a quantitative survey whereby qualified questions were distributed to 420 respondents from fifteen schools and one Educational Management Center (EMC in Jazan). All data was analyzed with the Structural Equation Model (SEM; Smart PIs Version 2.0 Beta). The result observe from Smart PIs show that the strength of the assay's results for all process paths and required criteria for successful CBT implementation of the proposed framework proved significant and were accepted as valid. T-statistic and P-statistic values of CBT processes are very significant because T-statistic value is significantly high ranking from 3.178 to 11.894. Also, T-statistic, P-statistic and  $R^2$  values of CBT criteria are significant because T-statistic value is significantly ranking from 1.97 to 6.31, and  $R^2$  value is significant with 0.60 value. Hence, this research presents a more workable systematic approach we confidently believe will aid the Educational Management Center in Saudi Arabia in their efforts to implement a successful CBT system. Hopefully, this conceptual framework will serve as a benchmark approach to CBT implementation and further research regarding applications to other educational venues.

## ABSTRAK

Bilangan pelajar meningkat secara berterusan berkadaran dengan meningkatnya keperluan bagi kaedah-kaedah penilaian dan ujian yang lebih efektif; trend yang memberi cabaran besar kepada para guru dan pentadbir yang menggunakan kaedah-kaedah berasaskan kertas. Penggunaan Ujian Berdasarkan Komputer (CBT) kini dilihat sebagai cara yang sesuai yang menyediakan keputusan-keputusan yang pantas dan boleh diakses dengan lebih ekonomi dan menyelesaikan masalah-masalah dengan tepat seperti keputusan ujian yang tidak tepat, kelewatan dalam maklum balas peperiksaan, dan kaedah-kaedah memberi skor yang tidak mencukupi yang merangkumi kaedah-kaedah berdasarkan kertas tradisional. Kelebihan CBT dan peningkatan berterusan dalam aplikasi-aplikasi Teknologi Maklumat dan Komunikasi (ICT) untuk pendidikan di Arab Saudi menyebabkan pihak Kementerian Pelajaran (MoE) membangunkan sistem "Tatweer" CBT bagi sekolah-sekolah menengah Arab Saudi. Tetapi, projek tersebut gagal bila dilaksanakan kerana kurang wawasan yang mungkin sebaliknya dapat menghasilkan protokol yang lebih jelas untuk diamalkan. Garis panduan seumpamanya mungkin boleh berdasarkan kepada kriteria yang dikehendaki bagi prestasi ICT yang berjaya sekiranya suatu kajian yang sesuai telah dibuat sebelum pelancaran. Maka, usaha ini mengkaji pelaksanaan CBT Arab Saudi dalam sistem sekolah menengahnya dengan pandangan untuk menetapkan dengan jelas panduan-panduan proses berdasarkan integrasi kriteria spesifik yang mempengaruhi kejayaan pelaksanaan CBT. Rangka kerja bagi pelaksanaan CBT dicadangkan telah diekstrak daripada enam kajian lalu mengenai usaha pelaksanaan CBT melibatkan Pembangunan Aplikasi Gabungan (JAD) dan dua belas pakar CBT di Arab Saudi. Kriteria yang dicadangkan telah didefinisikan selepas satu kajian telah dijalankan dengan empat pakar CBT. Pengesahan rangka kerja dicadangkan melibatkan satu kajian kuantitatif yang mana soalan-soalan yang layak telah diagihkan kepada 420 responden daripada lima belas sekolah dan satu Pusat Pengurusan Pendidikan (EMC di Jazan). Semua data telah dianalisa dengan Model Persamaan Struktur (SEM; Smart Pls Versi 2.0 Beta). Hasil didapati daripada Smart Pls menunjukkan kekuatan keputusan-keputusan ujian untuk kesemua laluan proses dan kriteria yang dikehendaki bagi pelaksanaan CBT yang berjaya untuk rangka kerja yang dicadangkan terbukti signifikan dan telah diterima sebagai sah. Nilai-nilai statistik-T dan statistik-P proses-proses CBT adalah sangat signifikan kerana nilai statistik-T mempunyai kedudukan tinggi yang amat signifikan daripada 3.178 ke 11.894. Seterusnya, nilai-nilai statistik-T, statistik-P dan  $R^2$  kriteria CBT adalah signifikan kerana nilai statistik-T didapati berkedudukan signifikan daripada 1.97 ke 6.31, dan nilai  $R^2$  ialah signifikan dengan nilai 0.60. Jadi, kajian ini membentangkan satu rumusan kerja yang lebih sistematik yang kami benar-benar percaya akan membantu EMC di Arab Saudi dalam usaha mereka melaksanakan satu sistem CBT yang berjaya. Diharapkan rangka kerja konseptual ini akan menjadi kaedah tanda aras bagi pelaksanaan CBT dan kajian lanjut mengenai aplikasi terhadap bidang-bidang pendidikan lain.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Overview**

A continual increase in the number of students presents a challenging need for more effective and precise student testing as paper based systems become obsolete. The advent of multimedia based systems have provided quality solutions with superior efficiency for accurate scoring, swift feedback, and self-paced testing schemes. Hence, this naturally attracted the attention of numerous organizations who began searching for Computer Based Testing (CBT) tools (Brown, 1997; Russell et al., 2010). The increasing desire to reduce examinee anxiety was joined by efforts to reduce cheating while challenging students without frustrating them, in addition to providing immediate and continual guidance throughout exams. At the same time learning objectives were added to help guide learners towards a more student-centered and personalized learning system. As a result, numerous organizations have drifted towards the use of CBT tools such as GRE, GMAT, TOEFL, and MCSE (Economides, 2007a).

The use of CBT assessment systems has rapidly gained recognition among several leading international schools and several research works have been carried out on the benefits and advantages of adopting and implementing CBT in schools. This innovative approach to assessment delivery has proved cheaper, faster, more accurate and more accessible than traditional paper-based methods (Erdogan, 2008).



Consequently, some schools have since adopted the Internet as a platform for online CBT implementation. Almond et al. (2010) reported that CBT offered broader accessibility for both able and disabled students and Thompson et al. (2002) defined considerations that better accommodated students with disabilities. Becker (2006) identified significant merits that included efficient administration, immediate results, improved writing performance, increased authenticity, and student preference. Thurlow et al. (2008) observed that CBT enabled students to better focus on instruction than on assessment. According to Salend (2009), CBT presented new approaches to student assessment that shifted from conventional multiple and constructed response choice items towards the preferred use of innovative evaluation tools that allowed students to manipulate the role played by data.

The advantages of CBT and the continual increase in ICT application for education in Saudi Arabia (KSA) prompted the Ministry of Education (MoE) to develop the “Tatweer” CBT system for Saudi Arabia's secondary schools (Ministry of Education, 2009). This project aimed to use ICT tools for student assessment and performance in different schools. A huge budget was allocated for state-of-the-art ICT equipment and teachers from select schools were trained in computer skill such as word-processing, file management, general computer usage, and the production of power point presentations.

However, Tatweer failed when put into practice due to a host of problems. The primary factor has been identified as a lack of research that might otherwise have produced a more appropriate implementation scheme. Unfortunately and as a consequence, the project mainly focused on CBT system technology. Hence, there was a failure to identify criteria that would have influenced the project's successful realization. The present study therefore, examines Saudi Arabia's CBT program for its secondary school system with a view to clearly stipulate process guidelines based on an integration of specific criteria that affect successful CBT implementation.

## 1.2 Research Background

The traditional ways to assess students' progress in Saudi Arabia are tests and examinations (Ministry of Education, 2007a). These play a vital role in education system and school accountability. These ways of assessing students' progress, also known as "summative assessment", are also used by employers and parents. This is not the whole story actually. To be truly reliable and effective, assessment must also be "formative" – which can be explained as collaboration and identifying learners' need (Harlen and James, 1997). In classrooms, interactive assessment is prepared by teachers in order to judge students understanding which is formative assessment. This in turn helps teachers to improve and adjust their teaching methods in order to help students to reach high goals and to fulfill individual student's need. At the moment, most CBT systems, particularly those adopted in Saudi Arabia make use of the summative assessment approach and in cases where formative is also used. Therefore, Ministry of Education decided to host a CBT project to reinvented a new assessment style for the country.

By the early 1990s, computer courses were integrated with secondary school curriculum as compulsory subjects in KSA. More recently, the MoE began equipping primary and secondary schools with computer labs and commenced teacher training. By the late 2000s, the MoE, under King Abdullah's reforms, commenced the pilot project, Tatweer, for CBT and ICT integration in a number of the kingdom's schools. Nearly 400,000 teachers (male and female) of different subjects were selected for training and provided with laptops. Schools were also equipped with state-of-the-art ICT equipment and infrastructure including smart boards, data projectors, e-learning systems, communication and Internet networks (Ministry of Education, 2007b). Fifty female and male secondary schools were selected for the pilot program for mainly CBT and e-learning facilitation. About 24,000 laptops were provided for students and teachers of the selected schools and the schools were equipped with the technologies cited above. Teachers from the selected schools were trained in computer skills such as word processing, file management, general computer usage, and power point presentations (Ministry of

Education, 2009). This initiative was discontinued however, due to a host of problems primarily resulting from a lack of foresight and study as cited.

### **1.3 Problem Statement**

As for the lack of an efficient proactive study for CBT realization, Saudi Arabia's MoE hosted the project with an international computer software company based in Jordan but without developing a plan for implementation. This caused a number of problems when the project was initiated by school authorities. The major problems cited were (i) a lack of system management guidelines; (ii) CBT processes were messed up; (iii) and teachers became confused when using the system.

Tatweer's being hosted by a remote software company without an appropriate implementation plan led to systemic failures due to a lack of knowledge of criteria that would have facilitated successful implementation. The project focused primarily on technology while neglecting users' knowledge of the system, CBT resources, user collaboration, and support services. Despite the provision of teacher training. The instruction provided as cited above proved inadequate which may have contributed to both teacher and student dissatisfaction with the system.

In response to the problems cited, the present work studied implementation failures with a view to develop criteria for solutions that would better enable CBT integration and performance in KSA's secondary school system.

## 1.4 Research Questions

As explained in Section 1.2, ICT project implementations in KSA is particularly focused on CBT projects for secondary schools. However, the project implementation failed due to a lack of proper guidelines and preparations before initiating the project. In some cases there was little or no project evaluation or project feedback to assess the program's effectiveness and progress. Hence, the main research question posed by this study is:

*“How do we develop a framework to implement CBT assessment that overcomes limitations presented by traditional paper-based testing in KSA secondary schools?”*

In order to answer this question, the following sub-questions must be considered:

*RQ-1) What criteria should be considered for effective CBT implementation for KSA's secondary schools?*

*RQ-2) What processes for CBT implementation are most suitable for KSA's secondary schools?*

*RQ-3) How can we formulate a framework for CBT implementation based on the relevant processes and criteria discovered pursuant to *RQs 1 and 2*?*

## 1.5 Research Objectives

In light of the problems so far described, the purpose of this study was to develop suitable protocols for CBT implementation in KSA secondary schools.

Hence, we aimed to identify critical success factors for the development of the proposed framework as follows:

1. To identify success criteria for CBT implementation.
2. To identify processes required for successful CBT implementation that are specifically fit for KSA secondary schools.
3. To develop and validate a CBT implementation framework based on identified CBT implementation processes and success criteria.

## **1.6 Scope of Research**

This research covered the domain of online CBT assessment including tests and examinations in Saudi Arabia's secondary schools. However, due to financial restraints, time, and other barriers such as approval from the Saudi government, this study limited itself to framework development only and did not include implementation and evaluation phases. Nevertheless, the proposed framework provides guidelines for CBT implementation for the Saudi Arabia secondary school system as well as critical success criteria for educational environment.

## **1.7 Significance of Study**

The proposed framework, if introduced, will hopefully make CBT utilization common place in KSA. CBT's superiority, particularly over paper and pencil testing methods, and its numerous benefits for teachers and students will be highlighted. We imagine this study will help facilitate broad utilization of CBT technology and resources to overcome limitations inherent to traditional, paper-based testing. The

latter method is not only time consuming but also uneconomic considering human and other resources required for test preparation, printing, marking, feedback and storage (Dikli, 2003). Traditional paper-based testing requires a great deal of archival and retrieval efforts and facilitation, in addition to problems associated with tracking, reporting student results, inaccuracy (marking and recording), as well as delays in final presentation and issuance of results. All of these limitations become more complex when students request re-marking of script and thus, when combined, constitute major administrative problems.

## **1.8 Summary**

This chapter provided an inclusive definition and introduction, including research aims, questions, scope and objectives. In addition, a comprehensive background of the problem as well as the significance and importance of this research were presented.

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