Statistics education in GCC business schools

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Abstract: The purpose of this paper is to investigate the state of statistics education in the Gulf Cooperation Council (GCC) business schools in terms of course content, teaching faculty, integration of technology, learning resources and teaching pedagogy in addition to achieved and foreseeable changes on the business statistics education. The study stems from the GCC's need to examine the quality of business education and more specifically the quantitative knowledge of business graduates. This need is driven by the large number of business graduates from higher education institutions in the GCC states and additionally their critical role in generating the knowledge-based economy aspired by the GCC countries. Moreover, the rising quest of GCC higher education institutions for international accreditation of business programs represents another motivation for assessment and reform of business education. A survey of GCC business schools was conducted using an online questionnaire. The results of the study are summarised and benchmarked against a recent study undertaken on top 50 US business schools. Generally, the study provided remarkable evidence about the quality of GCC business statistics education in terms of contents and technology integration; however, it posed several questions about the course delivery and curriculum review.

Keywords: business education; undergraduate business statistics; Gulf Cooperation Council; GCC; case-based education; knowledge-based economy.

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1   Introduction

The Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) have made considerable progress towards adopting a knowledge-based economy vision. In a knowledge economy, higher education plays an increasingly crucial role in providing the labor market with highly qualified and skilled entrants. Despite the remarkable progress achieved in building the IT infrastructure, the GCC countries need to focus more on human capital including skills, education and training to facilitate balanced development of their knowledge economies and full utilisation of their infrastructure (Kumar and van Welsum, 2013). In this context, business education has become a key player in higher education especially in GCC countries where business graduates represent around 15% of all graduates. Moreover, knowledge-based economy requires business education to supply managers with substantial business knowledge, leadership qualities, quantitative analysis abilities, problem solving skills and more importantly evidence-based decision making capacity.

The majority of business schools require their undergraduate students to complete at least one course in statistics. The Association to Advance Collegiate Schools of Business (AACSB) international standards for accreditation emphasises that business degree programs should include learning experiences that address statistics/quantitative methods impacts on business practices (AACSB International, 2013). Moreover, the AACSB standards emphasise the assurance of learning and continuous improvement through systematic processes to assess program learning goals and take the necessary measures to ensure the achievement of these learning goals. Within this context, it is noteworthy mentioning that seven of the GCC business schools are AACSB accredited, nine are in-process and 17 are AACSB members, planning for future accreditation. Undoubtedly, the increasing number of GCC business schools seeking such accreditation should have a positive impact on the quality of business education in the region.

The purpose of this study is to examine the quality of statistics education in the GCC business schools in terms of curriculum, teaching faculty, integration of technology, learning resources and teaching pedagogy. The results of the study are compared to similar studies undertaken in US business programs to provide insight into how business schools in the GCC region should reform the business statistics education to meet the international standards. This study is driven by the large number of business students graduating from institutions of higher education in the GCC countries and their critical role in developing a knowledge-based economy.

In this paper, a brief overview of the higher education in the GCC countries is presented, followed by a literature review. In the next section, the methodology employed in the study is discussed, followed by presentation of the results. Finally concluding remarks and recommendations are given in the last section.

2   Overview of higher education in GCC

The higher education sector in the GCC countries has witnessed remarkable developments in the last two decades. Throughout the GCC countries and particularly in the United Arab Emirates (UAE) and Kingdom of Saudi Arabia (KSA), an increasing number of new public and private colleges and universities have been established. For example, the number of higher education institutions licensed by the UAE Ministry of

Higher Education and Scientific Research (MOHESR) has increased from five in 1997 to about 79 in 2013 (Commission for Academic Accreditation, 2013). During the same period, the number of licensed institutions in KSA has jumped from seven public universities to 24 public universities, eight privates universities and 21 private colleges (Ministry of Higher Education, 2012).

Moreover, several renowned universities from the USA, UK, Canada, Australia and France have established overseas campuses in GCC countries, mainly in the UAE and Qatar. Similar, but slower growth rates, in the higher education sector can be observed in the other GCC countries. Generally, these changes have led to a notable growth in higher education opportunities in the GCC countries for citizens and expatriates residing in the region. According to World Bank statistics, the number of enrolled students in institutions of higher education in GCC countries has increased at an annual growth rate of around 10% since 1997, compared to a 4% population annual growth rate (World Bank, 2012). This indicates that the notable growth in higher education in the GCC countries is driven largely by the remarkable growth in higher education sector rather than mere growth of population in the region. Throughout the GCC countries, especially in UAE, Qatar and Bahrain, business programs are the most popular among undergraduate and graduate students. Recent official statistics indicate that business graduates represent around 15% of all graduates in GCC. This corresponds to 40% in UAE, around 25% in Qatar and Bahrain, and between 10%–15% in the other three countries.

The expansion of the higher education sector is expected to have a positive impact on the quality of higher education due to the pressure imposed on universities and colleges to compete by improving the quality of their academic programs and increasing the employability of their graduates (Lefrere, 2007). These expectations are reflected in the increasing expenditures of the GCC governments on higher education and the establishment of national regulatory and accreditation agencies such as UAE Commission for Academic Accreditation (CAA) and Oman Academic Accreditation Authority (OAAA). Despite these efforts, the quality of education in institutions of higher education remains a subject of concern in most GCC countries (McGlennon, 2006).

The 2013–2014 Global Competitiveness Report (GCR) released by the World Economic Forum (WEF) ranked 148 countries based on the Global Competitiveness Index (GCI). The index is based on the performance in 12 pillars of competitiveness of which higher education and training represent the 5th pillar (Schwab et al., 2013). Table 1 summarises the scores (out of seven) and the rankings of the GCC countries on three indicators, namely higher education and training, quality of the educational systems and quality of management schools. As seen in the table, Qatar and UAE are ranked higher compared to the other four GCC countries on these indicators. While KSA, Bahrain and Oman are ranked closely behind Qatar and UAE in the higher education and training and quality of the educational system indicators, Kuwait is positioned far behind these countries. As for the quality of management schools, Qatar is ranked in the 8th place, followed by UAE (28th), KSA (64th), Bahrain (85th), Oman (88th) and Kuwait (92nd). As noted earlier, Qatar and the UAE have taken advantage of engaging international partners in their higher education systems. While Qatar has invited selected international institutions to offer single programs on one campus, UAE has adopted the open door policy, allowing the international universities to offer programs based on students' demand and financial viability. This situation might explain the lead Qatar entertains over the other GCC countries in higher education ranking. The other GCC

countries, especially Kuwait, should take initiatives to improve the quality of their higher education systems.

Table 1   The global competitiveness education indices for GCC countries 2013–2014

Country	Higher education and training	Quality of the educational system	Quality of management schools
Qatar	5.1(29)	5.8(4)	5.7(8)
UAE	4.9(35)	5.1(15)	5.1(28)
KSA	4.7(48)	4.3(39)	4.3(64)
Bahrain	4.5(53)	4.1(48)	4.1(85)
Oman	4.5(57)	4.0(53)	4.0(88)
Kuwait	4.0(84)	3.1(106)	3.9(92)

Note: Table entries represent country index (country ranking).
Source: The Global Competitiveness Report 2013–2014

3   Literature review

Although there is a general consensus on the importance of teaching statistics to business students, remarkably little work has been done to explore the status of business statistics teaching in developed and developing countries. In the 1990s, few studies were conducted on business statistics education in the AACSB accredited US business schools (Levine, 1992; McKenzie et al., 1997; Tabatabai and Gamble, 1997; Parker et al., 1999), and Strasser and Ozgur (1995) conducted a study on members of the American Statistical Association (ASA) or the Decision Sciences Institute (DSI) who taught undergraduate business statistics courses. A recent study on business statistics (Haskin and Krehbiel, 2012) provided a comparative summary of the results of the five studies mentioned above. Haskin and Krehbiel explored the state of business statistics in the top 50 US business programs in terms of credit-hours requirements, topics covered, software use, teaching faculty, teaching methods, learning resources, and recent and proposed changes. The results reported in this paper will be used as a benchmark in this study.

In addition to these five studies, few more papers related to course content and teaching methods in business statistics have been published. Zeis et al. (2001) discussed the viability of covering data collection and management in one course followed by another course focusing on analysis and inference. Love and Hildebrand (2002) emphasised the role of active and cooperative learning in business statistics courses and stressed that these courses should be problem-oriented, not oriented towards particular statistical tools. Additionally, they noted that all students should have hands-on experience with data collection, analysis, and presentation of results. McAlevey et al. (2001) and McAlevey and Charles Sullivan IV (2001) conducted follow-up studies to evaluate the progress made on business statistics curricula in Australia and New Zealand based on the recommendations of the 'Making statistics more effective in schools of business (MSMESB)' conference. Finally, Pariseau and Kezim (2007) found that using case studies will improve the students' communication skills, software use, and ability to apply statistics to business decisions.

4 Methodology

The target population of this study consisted of 80 business schools licensed by GCC local ministries of higher education to offer undergraduate degrees in business. The universities' addresses on the web were collected from the websites of local ministries of higher education and the Webometrics Ranking of World Universities. Contact information of instructors teaching business statistics were collected through the universities' websites. Where instructors' contact information was not available, contact information of the deans of the business schools were used.

An online questionnaire, using the Survey Methods software, was used for data collection from the targeted business schools. The instrument used a modified version of the questionnaire used by Haskin and Krehbiel (2012). The questionnaire was designed to gather relevant data on the structure of statistics requirements, course content, teaching faculty, computer use and completed and foreseeable changes in business statistics education.

In October 2013, an invitation to complete the online questionnaire was emailed to the targeted instructors or deans. Two reminders were e-mailed to non-respondents within a month in an effort to improve the response rate. Thirty eight questionnaires were fully completed resulting in a 48% response rate. The list of responding schools included all AACSB accredited schools in GCC and most of AACSB members. More importantly, the list included the premier public universities which are graduating the majority of business students in the region.

Due to the exploratory nature of the study, only descriptive statistics methods are used in data analysis. The results will be compared to those obtained by Haskin and Krehbiel (2012) on the top 50 US business schools.

5 Results

The study revealed that the responding business schools are evenly divided in requiring one or two business statistics courses from their undergraduate students. The corresponding total credit-hours ranges from three to eight with a mean of about five hours and a median of six hours. Moreover, business mathematics/calculus is a core pre-requisite in approximately three-quarters of these schools.

5.1 Course structure

Table 2 presents the orientation of the required statistics courses and the faculty teaching these courses. The first course and the second course (if required) are classified as business statistics courses in more than 80% of the responding schools. The first and second statistics courses are taught by business-school faculty members in two-thirds of the schools. In more than 50% of the schools, statistics courses are taught by instructors from within the traditional business departments besides other departments such as quantitative methods and statistics. In more than 70% of the responding schools, the majority of teaching faculty consider statistics as their primary profession while only all faculty in two schools consider statistics as secondary profession. Unlike western universities, few GCC universities offer programs in mathematics or statistics and consequently statisticians and mathematicians are allocated into selected departments

within business schools. Overall, the results do not differ from the reported figures in the top US business schools in Haskin and Krehbiel (2012).

Table 2   Orientation of course and faculty

	No. (%) of GCC schools		No. (%) of US schools	
	1st course	*2nd course*	*1st course*	*2nd course*
Course type				
Business	31 (82)	16 (84)	43 (86)	16 (100)
General	7 (18)	3 (16)	7 (14)	0 (0)
Teaching department				
Statistics	6 (16)	3 (17)	13 (26)	1 (6)
Mathematics	11 (29)	5 (28)	3 (6)	
Other science	2 (5)	0 (0)		
Economics	4 (11)	1 (6)	9 (18)	5 (31)
Other business	15 (39)	9 (50)	25 (50)	10 (62)
The course is taught inside the business school				
Yes	25 (66)	14 (74)	34 (68)	13 (81)
No	13 (34)	5 (26)	16 (32)	3 (19)
Faculty orientation				
All consider statistics to be their primary profession	11 (29)	10 (53)	18 (36)	5 (31)
Most consider statistics to be their primary profession	16 (42)	4 (21)	12 (24)	3 (19)
Most consider statistics to be a secondary activity	9 (24)	3 (16)	13 (26)	4 (25)
All consider statistics to be a secondary activity	2 (5)	2 (10)	7 (14)	4 (25)

5.2   *Course content*

Consistent with the topic coverage in the top US business schools, almost all responding schools emphasise descriptive statistics, probability concepts, probability distributions, sampling distributions, confidence intervals, hypothesis testing and simple linear regression and correlation as seen in Table 3. In addition, most schools cover Chi-square/contingency tables (66%), analysis of variance (61%) and multiple regression (55%). Although less than 25% of these schools require Bayesian decision making, index numbers and statistical process control, these topics are commonly covered in operations management, microeconomics and quality management courses. Only one school offers some operation research topics such as linear programming and queueing in the second business statistics course. The average number of covered topics is ten, with a range of five to 15 topics. Interestingly, there were no differences in the topics covered in schools requiring one statistics course and those requiring two courses. This might be due

to the heavy use of computer in teaching at schools requiring exactly one course, which frees up more time to cover a wider range of topics.

Table 3   Business statistics course contents

Topic	No. (%) of GCC schools	No. (%) of US schools
Descriptive statistics	38 (100)	50 (100)
Probability distributions	38 (100)	48 (96)
Sampling distributions	37 (97)	49 (98)
Hypothesis testing	37 (97)	49 (98)
Probability concepts	36 (95)	50 (100)
Confidence intervals	36 (95)	50 (100)
Simple linear regression/correlation	36 (95)	48 (96)
Chi-square/contingency tables	25 (66)	28 (56)
Analysis of variance (ANOVA)	23 (61)	17 (34)
Multiple regression	21 (55)	37 (74)
Time series/forecasting	14 (37)	15 (30)
Non-parametric methods	11 (29)	6 (12)
Bayesian decision making	9 (24)	12 (24)
Index numbers	6 (16)	3 (6)
Statistical process control	5 (13)	13 (26)

Table 4   Probability distributions and hypothesis testing

Topic	No. (%) of GCC schools	No. (%) of US schools
Probability distributions		
Normal	38 (100)	48 (96)
Binomial	33 (87)	41 (82)
Poisson	27 (71)	20 (40)
Uniform	21 (55)	31 (62)
Exponential	14 (37)	36 (72)
Hypergeometric	10 (26)	11 (22)
Hypothesis testing		
Single mean	37 (100)	49 (98)
Single proportion	32 (86)	44 (88)
Two means – independent	30 (81)	39 (78)
Two means – dependent (paired)	27 (73)	27 (54)
Two proportions	24 (65)	30 (60)
Single variance	23 (62)	14 (28)
Two variances	20 (54)	11 (22)

Table 4 provides a summary of the extent of coverage of probability distributions and hypothesis testing topics in the GCC business schools. As shown in the table, all responding schools covering probability distributions and hypothesis testing teach the normal distribution and single mean tests while most schools emphasise binomial and

Poisson distributions, single proportion, two independent means and two dependent means. This topic coverage is notably similar to that of US programs but with more emphasis on Poisson distribution and tests of variances and less coverage of exponential distribution. On average, the responding schools cover four probability distributions regardless of the number of required courses; however, schools requiring two courses cover one test more (six tests) than those requiring only one course.

5.3   Software packages usage

Table 5 summarises the results on computer integration in business statistics in the responding GCC schools. The study revealed that while 95% of responding schools use statistical software in the first course, 86% of them use it in the second course. Excel, with add-ins such as MegaStat and Data Analysis Plus, was the most commonly used package (39% and 37%) while Excel without add-ins was used by 21% in the first course. SPSS and Minitab packages were also used in approximately one-third of these schools in both courses. In addition, two schools indicated using Excel and SPSS jointly while another school used StatCrunch. It is interesting that one school cited using the operation research software, Data Envelopment Analysis, only in the second course while while another school indicated its use in addition to Excel in the second course for demonstration purposes. Among the schools not using software in the first course, one school requires one course and the other requires two courses and no software usage is indicated in both courses. Two schools requiring two courses indicated using software only in the first course. Overall, the results of this study were consistent with the figures reported by Haskin and Krehbiel (2012).

Table 5   Statistical software packages used in the business statistics

Software package	No. (%) of GCC schools		No. of US schools	
	1st course	*2nd course*	*1st course*	*2nd course*
	($n = 38$)	($n = 19$)	($n = 50$)	($n = 16$)
Excel (no add-ins)	8 (21)	0 (0)	25	7
Excel (with add-ins)	15 (39)	7 (37)	9	2
SPSS	8 (21)	3 (16)	2	0
Minitab	3 (8)	3 (16)	15	5
StatCrunch	1 (3)	0 (0)	1	0
Data Envelopment Analysis	0 (0)	1 (5)	0	0
Excel + SPSS	1 (3)	2 (10)	NA	NA
Other	0 (0)	0 (0)	4	3
None	2 (5)	3 (16)	5	0

Note: The totals reported in US schools exceed *n* since some schools use more than one
        package in a course.

5.4   Textbooks usage

A wide range of textbooks is used in the business statistics courses. More than 25 textbooks are cited by the responding schools. Eight books are locally published

including four published in Arabic. As seen in Table 6, two textbooks were cited by five schools while five others were indicated by two schools. Moreover, 14 more popular western textbooks were used by other schools. Almost all cited textbooks are similar in terms of content, complexity and relevance for business students; nevertheless, the major difference is the software package utilised in illustrations and computations. Although most of these textbooks are used by premier US business schools (Haskin and Krehbiel, 2012), the main concern lies is the relevance of western, in particular American, problem sets, exercises and applications to the Arab context. A study by Sebastianelli and Trussler (2006) on 20 business statistics textbooks, including most of textbooks cited in this study, indicated that only 3.65% of problem sets, exercises and/or applications contain some type of international reference. It is worth mentioning that the business statistics textbooks authored in the Arab world in English language are very scarce. As for textbooks published in Arabic, they lack quality and real life applications.

Table 6   Textbooks used for business statistics courses

Title (number of schools)	Author
Managerial Statistics (5)	Gerald Keller
Statistical Techniques in Business and Economics (5)	Lind, Marchal and Wathen
Business Statistics in Practice (2)	Bowerman, O'Connell and Murphree
Statistics for Business and Economics (2)	McClave, Benson and Sincich
Statistics for Business and Economics (2)	Anderson, Sweeney and Williams
Statistics for Managers Using Microsoft Excel (2)	Levine, Berenson, Stephan and Krehbiel
Essentials of Business Statistics (2)	Bowerman, O'Connell, Murphree and Orris

5.5   *Course delivery*

Generally, the class size in the responding GCC business schools is below those reported in the top US business schools. The average class size in the first course ranged from 15 to 50 while it ranged between 20 and 60 in the second course. Regardless of the course, the mean and the median of the class size were 31 and 30, respectively. Table 7 presents the various course delivery characteristics of business statistics. In 92% of the responding schools, English is the predominant language of instructions; moreover, one of the three schools teaching in Arabic is launching new business programs in English in Spring 2014. Furthermore, the majority of the responding schools (67%) indicated that lecturing is the dominant class delivery method whereas only one-third are incorporating active learning activities in class. These results agree, by and large, with those of the top US business schools. With respect to use of technology by students in classroom, the survey revealed that around two-thirds of the responding schools indicated that their students were required to either have a laptop (17%) or meet in a computer laboratory (47%). Although some studies (Spinelli, 2001; Martin, 2011) indicated that there is no significant advantage in using statistical packages in classrooms or conducting class in a computer equipped classroom, the recommendations of the MSMESB conference emphasised the use of projects, real data, simulations and hands-on technology practice in classroom to improve the quality and effectiveness in business statistics teaching (Love and Hildebrand, 2002). For the schools using active learning activities, many have reported

the use of software packages during lectures individually and in groups for problem solving in addition to the use of real life situations, case studies, student presentations and experimentation. Nevertheless, modern business schools should focus more on student-centered learning by lecturing less and adopting other ways to engage students in the learning and enrich their statistical and business thinking abilities. The list of these ways include, but not limited to, using online resources and databases, visiting companies, solving case studies, and inviting speakers from local business community.

Table 7   Course delivery

	No. (%) of GCC schools	No. (%) of US schools
Language of instruction		
English	35 (92)	50 (100)
Arabic	3 (8)	NA
Course delivery[*]		
The class is predominantly delivered in a lecture format	24 (67)	44 (88)
The class involves some active learning activities	12 (33)	33 (66)
Use of technology in class		
Students are required to have a laptop	6 (17)	9 (18)
Class meets in computer lab	17 (47)	NA
No use of technology in the classroom	13 (36)	NA
Assessment methods		
Business case studies/projects	19 (50)	NA
Group assignments	23 (61)	NA
Class discussion and participation	26 (68)	NA
Oral presentations	8 (21)	NA

Note: [*]The two items were included as two separate questions by Haskin and Krehbiel but as two exclusive options in one question in this study.

In terms of the use of assessment methods, besides exams, to evaluate students' performance in business statistics, half of the responding GCC schools indicated that they use case studies and projects; while around two-thirds of the schools reported using group assignments and class participation. However, oral presentation as an assessment tool is used in only 21% of the schools. It is worth noting that most Arab universities require, in their policies, allocating more than 60% of course grade to written midterm and final exams and hence less emphasis is placed on other assessment activities. Undoubtedly, such practice hinders the development of general skills such as oral and writing communications, interpersonal relations and teamwork, and informed decision-making. In addition, the limited use of assessment methods will eventually weaken the assurance of learning activities designed to assess the achievement of the aforementioned general skills.

5.6 Recent and proposed changes

About one-third of the responding schools reported that they have made major changes in the course content and delivery in the past five years compared to 64% of the US business schools. The reported changes emphasised heavier use of instructional technology in classroom and introducing new software packages such as StatCrunch, Data Envelopment Analysis, and R. One of the commonly cited changes was the use of online resources such as Java Applets, PowerPoint lectures, online quizzes and online practice problems accompanying textbooks. Moreover, the respondents indicated that they incorporated projects, case studies, computer assignments, oral presentations and group assignments in student assessment. One school reported the merge of the two required business statistics courses into one unique required course while another school launched a new project to use iPads instead of laptops in classroom.

The survey revealed that about 40% of the respondents expected more changes in the next two to three years. Three-quarters of schools reported making changes during the last five years and only 19% of those who did not make any changes foresee more changes on road in the next two to three years. Among these changes, respondents expected to have more emphasis on introducing new technologies (iPad and new packages), incorporating real life applications and field work practices, using more interactive learning, updating course content, and adopting new classroom pedagogy.

The review of reported accomplished and foreseeable changes in business statistics course raises a question about the continuous improvement and innovation in business statistics education in GCC business schools. Continuous review and application of required improvements and innovations to course content, instruction techniques and assessment methods are essential to the success of educational programs. As mentioned above, nearly two-thirds of schools indicated that no major changes have been made in the last five years and more surprisingly about 60% expected that no changes will be considered in the near future; despite the notable technological, economic and financial changes worldwide. This may, in part, reflect the status quo culture within GCC and low interest in inducing change.

6 Conclusions

This paper investigated the current status of statistics education at the GCC business schools in terms of course content, teaching faculty, integration of technology, teaching pedagogy, changes made over the last five years and the foreseeable changes in the coming two to three years. The results were based on online survey collected from 38 business schools. The results concur to a large extent with a recent similar study conducted on the top 50 US business schools. Undoubtedly, this consistency attests to the quality of statistics education in the GCC business schools in terms of contents and technology integration but nevertheless, it raised several concerns about the teaching pedagogy and curriculum review.

The study revealed that half of the responding schools require two business statistics courses while the other half requires one course only. In the majority of the surveyed universities, business statistics courses are taught mainly by faculty members who consider statistics as primary profession though they are affiliated with departments other than statistics inside the business schools. The topics covered are very similar to US

business statistics curriculum and include descriptive statistics, probability concepts, probability distributions, sampling distributions, confidence intervals, hypothesis testing and simple linear regression and correlation. All schools covering probability distributions and hypothesis testing emphasise the normal distribution and single mean tests. Additional topics covered by the majority of the schools include binomial and Poisson distributions, single proportion and two means tests. Computers are widely used in most schools and 95% of the schools use statistical software, mainly Excel, in the first course. A wide range of textbooks are used by these schools, with two common textbooks being used in about 25% of the responding schools. Although classes are on average smaller than classes in US schools, less active learning activities are implemented, and lecturing remains the dominant teaching method. Around one-third of responding schools have made changes in course content and delivery in the last five years where most of them emphasise the use of technology and active learning activities. As for the foreseeable changes, they focus on incorporating new technologies and updating assessment methods.

Generally, the study provided a notable evidence on the viability of the statistics education at the GCC business schools including course and faculty orientation, technology integration and quality of textbooks used. Nevertheless, the study revealed some weaknesses in the areas of teaching pedagogy, assessment methods and curriculum review process. As the GCC countries move toward knowledge-based economy, business graduates representing future managers and decision-makers should possess strong quantitative analytical skills for crucial data-driven decisions. Such skills are developed by allowing students experience the managerial role through hands-on experience with data collection and analysis. Obviously, this requires major changes in course delivery and assessment methods. As discussed by Love and Hildebrand (2002), there should be less lecturing and more student engagement in the classroom. The active learning approach is particularly well suited for teaching statistics and quantitative methods because student must acquire problem solving skills and should be widely adopted in the business statistics courses. Instructors should invite business leaders and guest speakers from the business community to lecture students about the importance of quantitative methods in today's business.

More importantly, analysing relevant business case studies will, undoubtedly, help students develop skills such as statistical thinking, problem solving, decision-making, effective communications and teamwork and will enrich the learning environment. Due to the lack of business case studies related to Arab World, the main challenge to statistics instructors, and business instructors at large, lies in narrowing this gap by developing relevant case studies and publishing textbooks with stronger international flavor (Gillespie and Riddle, 2005). The establishment of El-Khazindar Business Research and Case Center at The American University in Cairo, Egypt in 2007 represented a remarkable transformation aimed at bridging the gap between theory and practice in the Middle East and North Africa (MENA) region. The center published its first book on business cases in the MENA region in 2011 and participated in launching *The MENA Journal of Business Case Studies*. Building on such success, research foundations and educational institutions in the MENA region should encourage and support business faculty to produce business cases as part of their scholarly contribution. Moreover, educational institutions should strengthen their relationship with Arab business community to investigate and articulate the success stories in the region.

Regarding assessment methods, less emphasis should be placed on exams and more on activities such as case studies, group projects, presentations and in-class discussion and participation to emphasise the aforementioned skills. In addition, more emphasis should be placed to ensure the effective use of statistical methods in the diverse courses offered in the business school so that students can link what they learn in statistics to their knowledge in business.

A thorough review of the accomplished and foreseeable changes cited by responding schools poses a crucial question about curriculum development and review processes at the GCC business schools. A modern business school should regularly review its curriculum and benchmark it against best international practices in terms of contents and delivery. Moreover, assessment of statistics and quantitative learning outcomes should be done systematically and the curriculum should be revised and updated in light of the assessment results. Finally, this study reveals the need of further in-depth research to investigate the effects of faculty characteristics on teaching pedagogy and course delivery.

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