

## STATISTICS CAPACITY BUILDING AND ALIGNMENT OF LEARNING OUTCOMES WITH BUSINESS SECTOR NEEDS IN THE GCC COUNTRIES

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*In quest of a common market, the Gulf Cooperation Council (GCC) countries are in need to monitor economic convergence and monetary policies. This requires a common methodology for collecting, processing, and disseminating data. National statistical agencies staffed mainly by statistics graduates of local colleges play an overarching role in this process. Hence, educators of statistics share responsibilities for provision of training, capacity building, and creation of national experience in statistical work. This paper assesses alignment of learning outcomes of teaching statistics in GCC countries with the business sector needs, in particular supporting the endeavor towards economic integration. The study surveys programs of statistics with regard to curriculum intend to equip statistics graduates with knowledge and skills needed to solve business problems and monitor economic convergence.*

### INTRODUCTION

Huge unplanned information is currently being produced ever than before (McKinsey Global Inst., 2011). In today's networked world, National Statistics Offices (NSOs), in addition to other agencies, play a critical role in the collection and generation of data. As a consequence, considerable budgets are being spent by governments, business, and industry on statistical and data agglomeration programs to derive value and tap into the knowledge engulfed by inundating volumes of data. This is actually driven by a multitude of targets, including improving decision-making and services, and improving or enabling new products. In the economic context, the need for valid knowledge and quality information that influence decision-making is critical for many purposes, including assessing economic conditions, growth, and stability (UNSD, 2013). The Gulf Cooperation Council (GCC) countries (Saudi Arabia, UAE, Kuwait, Oman, Bahrain, and Qatar) strive towards a common market and monetary union based on economic convergence. To realize such ambitions, the GCC countries, need to develop an integrated system of economic statistics that responds to the needs of statistical production processes, ranging from collection to dissemination of large volumes of data on a common, modern platform, according to standards, concepts and nomenclatures that allow harmonization and national and international comparisons (Cravo, 2008). A key element in meeting these challenges is having the right people in place to guide this process. There is an urgent need for statistical capacity building and the development of quality human resources. This depends on the ability to source qualified college graduates and attract experienced labor force, together with the ability to provide the required professional and organizational training. Hence, there is a high demand for data savvy know-how (Barth and Bean, 2012). As such, consequent pressures are being exerted on higher education systems and training institutions to adapt to the needs of emerging information and data-driven economy, currently suffering from significant shortages of talented data analysts and scientists (Feldman et al., 2017).

The main target of this study is, therefore, to measure the level of alignment of statistics learning outcomes with official agencies and business needs as recommended by professional statistical societies such as the American Statistical Association (ASA-GW, 2014). The work, therefore, explores qualifications and readiness of graduates of statistics from GCC higher education institutions in terms of knowledge, on-the-job real life workplace training, and the level of statistical, mathematical, and computing skills needed to build a consistent framework of economic activities based on integrated statistics, essential for monitoring economic convergence in the GCC countries. As noted by the UNSD (2013), integrated economic statistics provide a consistent and reliable assessment of a country's economic activity for policy and analytical uses in an increasingly data-driven and interconnected global economy.

## STUDY DATA

Information about higher education statistics curriculum that prepares graduates of statistics in the GCC countries was solicited from surveying the 10 public universities offering undergraduate programs in statistics in the region (5 in Saudi Arabia and one in each of the other five countries). The gathered data are used to assess the alignment of statistics and other learning outcomes with generally the labor market requirements, including the NSOs needs for a qualified and skilled cadre. A total of 9 universities, offering 10 programs in statistics, responded to the survey. In addition to general questions such as language of instruction and the number of statistics graduates from each program, received responses included topics covered in the program, together with feedback on issues such as curriculum content, assessment of learning outcomes, teaching methodology and tools utilized in the teaching process.

## DATA SUMMARY

As shown in Table 1, 30.0% of the statistics programs in the GCC countries are housed within art or business colleges. The majority of the programs (90.0%) graduate less than 30 statisticians each year, this is very low in the context the GCC population of over 50 million inhabitants (Gulf Research Center, 2017). The English language serves as a language of instruction for all programs. The business and industry sectors are still lagging behind official and government agencies employing significantly small numbers of graduates of statistics, none of the responding programs considered them as top priority for their graduates. Factors contributing to low employability might be grounded on at least one of two arguments. First, the business sector in the GCC world might have not yet reached the understanding of the role statistics play in this information era; second, graduates of statistics are still lacking the relevant skills and characteristics needed in the business and industry sectors.

Table 1. Summary of some general variables in the surveyed sample of statistics programs.

Variable		n	%
College where statistics program housed	Arts/Business/Economics	3	30.0
	Science/Mathematics	7	70.0
Language of instruction	English	10	100.0
Number of graduates (annually)	Less than 10	3	30.0
	10-29	6	60.0
	30-49	1	10.0
Main employers of graduates of statistics:	Statistics Centers	3	30.0
	Government	7	70.0
	Business/Industry	0	0.0

Sources: Authors' Summary Based on the *Statistics Programs' Survey*, 2017.

## CURRICULA ALIGENMENT WITH BUSINESS NEEDS

Higher education institutions and training agencies have long been required to provide the right mix of educational outcomes and skills to both meet students' employment needs and match the labor market and business requirements (Simon et al., 2009). Barth and Bean (2012) identified three curriculum skills that the data analysts should have in order to fit into information era and respond to increasing enterprise and business needs; namely, skills to combine data, analytical, statistical and mathematical skills, and computer science capabilities together with the ability to communicate effectively, altogether these requirements are termed data science experience (De Veaux, et al., 2017). According to Davenport and Patil (2012), challenges to sourcing data science skills are incredible, about 72% of 500 surveyed organizations indicated that it is very difficult or challenging to hire data scientists. Higher education institutions, however, have earnestly embarked into curricula initiatives and updates to face these challenges and to fill the gap (De Veaux, et al., 2017). In this context, to assess how far GCC higher education systems are responding to and aligning with the current business needs, Table 2 displays the level of current statistics programs' coverage of important data analytics and statistics learning outcomes that are required by the labor market as essentials for information processing and the transformation into a knowledge-based economy. The tabulated results were based on the survey of statistics programs in GCC countries

discussed earlier. There are two critical curricula elements (Table 2) in which statistics programs in GCC countries need to have further investments; namely, foundations in mathematical skills and the development of effective written and oral communication skills. This could be achieved, for example, by increasing the mathematical components in statistics programs offered by business colleges while the communications skills could be promoted by including writing or communications course(s) in programs offered by science colleges.

Table 2. Important analytical, statistical, mathematical, and computing learning outcomes addressed by Statistics Programs in GCC Countries

Learning Outcome	n	%
Mathematical skills	7	70.0
Design & survey studies	8	80.0
Computing (programming and simulations)	9	90.0
Statistical modeling	9	90.0
Effective communication skills (written & oral)	6	60.0

Source: Authors' Summary Based on the Statistics Programs' Survey, 2017.

Detailed inspection of topics covered by statistics programs in GCC countries depicts serious curricula defects with regard to abilities and skills really in need in business and industry to unlock new insights from large and diverse sources of data. Sixty percent of the statistics programs in the GCC countries, Table 3, cover *data manipulation, and computation*. Full coverage of topics on *practicing of statistics* in terms of ability to understand and communicate statistical findings, is another challenge that faces statistics programs in GCC countries, only 60% of the programs are committed to full coverage of *practice of statistics*. Big data and data science initiatives are yet to receive the required curriculum attention in terms of planning and updates, only 10% of the statistics programs in GCC countries fully cover topics on *big data and data science*. Feldman et al. (2017) and Harris et al. (2013) indicate that various data analysis tasks nowadays require diverse and multidiscipline knowledge and skills. They noted that the most demanded skills of a data scientist include ability to designing statistical models, capability to write computer codes and create machine learning and text mining algorithms, ability to perform data management and cleaning, and ability to carry out model quality assurance testing together with the ability to clearly communicate and visualize results. Based on this, it seems that all GCC statistics programs are in high need to revamp curricula and entice new updates to match fast evolving business and industry needs.

On the other hand, further evidence presented in Table 3, indicate that ethical responsibilities and guidelines, that govern data collection, manipulation, and related activities, are not receiving genuine coverage in the majority of the statistics programs in the GCC countries. This is a serious cause for concern, lack of knowledge about ethical expectations and responsibilities might endanger the whole analysis process and could result in data manipulation and breach of privacy and confidentiality (Feldman et al., 2017).

Moreover, full commitment to on-the-job real life workplace training programs, internship, is observed only among half of the GCC statistics programs as depicted in Table 3. The importance of this kind of training is that it emphasizes learning-by-doing, offers the students the technical skills and hands on experience that business, industry, and official agencies are looking for.

Table 3. Curriculum topics covered by Statistics Programs in GCC countries.

Topic	Not covered		Implicitly covered		Partially covered		Fully covered	
	n	%	n	%	n	%	n	%
Statistical methods and theory	0	0.0	0	0.0	3	30.0	7	70.0
Data manipulation and computation	0	0.0	1	10.0	3	30.0	6	60.0
Practice of statistics (Ability to understand	0	0.0	0	0.0	4	40.0	6	60.0
Big data and data science concepts	3	30.0	1	10.0	5	50.0	1	10.0
Disciplines other than statistics	1	10.0	3	30.0	1	10.0	5	50.0
Ethical guidelines	1	10.0	5	50.0	3	30.0	1	10.0
Internship	5	50.0	0	0.0	0	0.0	5	50.0

Source: Authors' Summary Based on the Statistics Programs' Survey, 2017.

## CONCLUSION

The study explored the alignment of learning outcomes of graduates of statistics from GCC higher education institutions with business needs. Results demonstrate that curriculum contents and planning are short of providing data science skills and capabilities needed by emerging data-driven business and economy. As such, curriculum updates are urgently needed to adapt to the new digital universe.

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