

# Competence-Based Approach to Statistical Capability Development

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The national statistics office of Abu Dhabi Government, Statistics Centre Abu Dhabi (SCAD), has started a journey aiming to revolutionize and modernize the business of official statistics. One of the key components of such a modernization is to establish a highly skilled and competent cadre of statics and data science practitioners to operate within the data and statistical ecosystems within the Emirate.

In this paper we discuss and highlight how the Statistical Training Institute (STI) of SCAD has designed a new approach to capabilities development in the fields of Data Science, Statistics and Foresight that utilizes a competence-based approach which focuses on defining the skills and knowledge required to perform certain statistics or data-related tasks. The development approach also uses, and continues to further explore, how different learning platforms and models could be utilized in order to create a learner-centric experience that adds the most value for the learners.

The competence-based development approach has the potential to serve as a model for other statistics offices to use and further build upon with the aspiration to develop a model that helps achieve and sustain statistical development maturity.

Key words: Competence-Based Development, competency framework, self-paced learning, learning support, content design.

## Introduction

The proliferation of the world of data sources and the volume of potential information that is becoming available for organizations and governments to make use of and base their strategic decisions upon necessitates more than ever that statisticians and data scientists be adaptable, flexible, and capable of advancing their practice to adapt to rapidly changing statistical needs. In light of these changes, SCAD decided to undertake an exercise to review its current practices in order to ascertain how it can better evolve and adapt to become a pioneer in the field of data science and statistics and to be a spearhead in driving the transformation towards a

data-driven public sector. In order to achieve the organizational efficiency that it aspires to have and to optimize the processes in which it collects and processes data, SCAD went through an organizational optimization process which resulted in a new business model which dictated a new organizational structure and a new mandate pertaining to effective data gathering and statistics publications.

## **New Strategy**

SCAD's new strategy focused on four strategic objectives which are futuristic and innovative and included in addition to the production of timely and accurate statistical products, developing the statistical ecosystem and advancing the data environment maturity in addition to providing data-driven and user-centric insights. The novel SCAD operating model introduced two new practices, one related to the statistical ecosystem and the production of official statistics and the other pertaining to the conversion of data into strategic assets which would ultimately enable a data-driven public sector. The first practice mandated the decentralization of the data collection and the statistical indicators production. This meant that government entities will be responsible for the collection of data related to their business and they will be responsible for the production of their own statistical indicators after they receive the approval of SCAD. This places SCAD as the data governance authority within the Emirate. The second practice mandates SCAD to derive foresight from the data collected and provide decision makers with timely insight to support data-driven decision making.

## **New organizational Structure**

The organizational optimization project concluded with a new organizational design that supports the broadened scope of the Statistics Centre and aligned with the Generic Statistical Business Process Model (GSBPM). The new structure organized the organization into five sectors:

1. Data
2. Statistics
3. Foresight and Communication
4. Strategy and Planning
5. Corporate Support

The new structure was designed to allow for better governance, increased efficiency, faster and more effective decision making, improved quality of outputs, enhanced customer centricity and greater preparedness for future challenges.

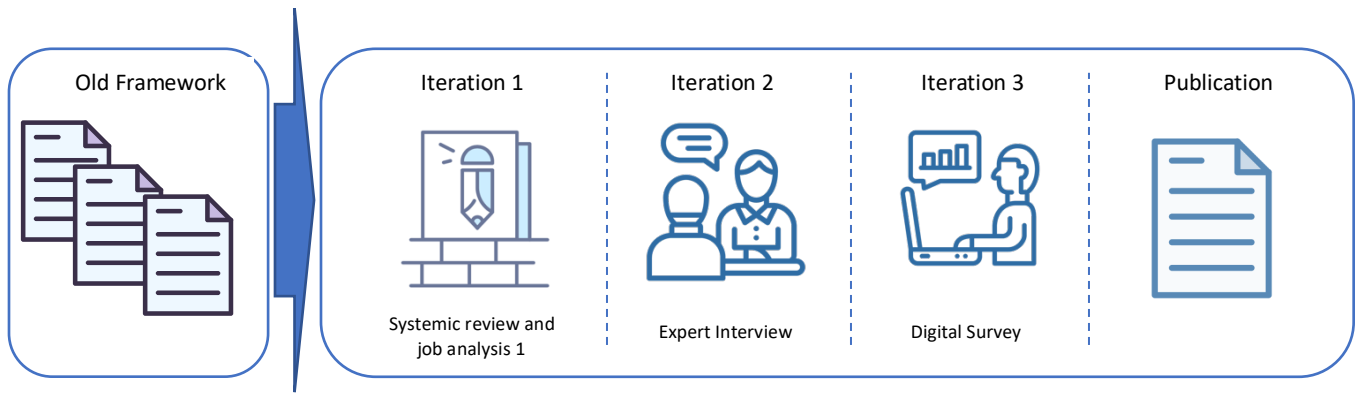
### **Delineation and Alignment**

Although the new organizational structure remains aligned with the GSBPM, there has been some delineation between Data-related activities and statistical activities, nevertheless, the operational model ensures the collaboration and the seamless transitions and communication between the two functions. The quasi-delineation required a definition of the roles of the data scientists and statisticians within the new model. For this purpose a new competency framework was required to define specifically the skills and knowledge required for both data scientists and statisticians. The framework was also required to align the capabilities of the individuals who work within the de-centralized entities with those who work within the Statistical Centre as collaboration and data exchange is an imperative requirement within this model of statistical operation.

### **Competency Framework and Career Path**

A new competency framework was designed in order to define the skills and knowledge required for each role within the organization and any similar role within the decentralized entities. The concept of competency was introduced in the research of C. McClelland's "Testing for competence rather than for intelligence" in the year 1973 where he emphasized the importance of individual competence for successful performance. Since then, various scholars further studied the concept with different aspects and mostly reached a consensus on the behaviors needed to complete the tasks of a specific job to ensure individual performance. The competency framework (CF), or the competency dictionary, has been conceptualized as the combination of necessary competencies for an individual or organization to ensure the required performance.

The technical competency framework of SCAD was designed on an individual role level allowing for a clear skill and knowledge requirements for every role within the organization. The framework allowed as well as for a clear career path, and any incumbent may use the framework to identify the skill level and knowledge required to progress within the organization. Below is an illustration of the process of designing the technical competency framework.



The framework was designed to be easy to use and written very clearly for the purpose of allowing for maximum benefits for the employees. One can identify their required competencies along with their level with a very simple process.

1. Identify the role that they are interested in learning about
2. Choose whether they are interested in the primary or secondary technical competencies or the behavioral one
3. Receive a list of the required competencies that are further defined along with their perspectives (indicators) along with competency level.

Competencies are arranged in a hierarchy of four levels of knowledge

1. Shaping: providing guidance
2. Leading
3. Applying
4. Developing.

Below is an illustration of the simplicity of access for information within the framework.

**1. Identify the**

**2. Choose the competency type**

**3. List of role competencies**

## **Statistical training Institute (STI)**

The new business model which introduced the two new practices discussed above necessitated the creation of the “foresight and communication” sector, which was tasked with the responsibility for deriving foresight, from the data collected, and providing it to decision makers. The decentralization initiative was tasked to a core team at SCAD which was required to ensure that the entities which will become responsible for the production of their own statistics are equipped with the necessary capabilities. However, in both cases there was a need for the intervention of the Statistical Training Institute (STI) to step in and take a central role in fulfilling the requirements for the two new practices through:

1. Provide the development required for the individuals who will be responsible for deriving the foresight and the insight from the data
2. Provide the capability development for the decentralized entities so that they have the necessary skills and knowledge to produce the south statistics.

## **Competence-Based Development**

The terms competence and competency are used interchangeably in many cases to describe a skill or required knowledge for an activity or process. We used the term competence in the title of this paper in line with the UK-based approach that puts more focus on ‘competence’ defined as the ability to apply knowledge, understanding, and skills in performing up to the standards required in employment. The term competence was first coined by White (1959) to describe personality characteristics responsible for effective interaction (of the individual) with the environment (workplace), associated with superior performance and high motivation. Thus, in line with Prahalad and Hamel’s organizational-oriented approach, our focus is on task-oriented analysis, which reflects expectations at the workplace. Competence is seen as a description of an action, behavior, or outcome, which an employee should be able to demonstrate. Nonetheless, we use the two terms competence and competency interchangeably.

## **Why competence-based approach**

Competency-based development (CBD) is an outcome-based, student-centered form of instruction where students progress to more advanced work upon mastering the necessary prerequisite content and skills. Theory and research in the field of competence-based learning or education provides evidence that this approach results in better competence development and is driven by the aspiration to achieve superior performance at the individual and organizational levels. Over the past decade, there has been a shift in science, technology, engineering, and math education towards a competency-based pedagogy. As a matter of fact, calls have been made to apply Competency Based Medical Education (CBME) beyond residency and develop competency based continuing professional development. This is due to the fact that (CBME) has been established widely as “the default position for undergraduate and postgraduate medical education”. Taking into consideration that practicing doctors are entrusted by society with the lives and well-being of patients without direct supervision, it comes as intuitive that the competence or competency-based approach is the most effective approach to develop statistical capabilities as it is in developing medical skills.

## **Characteristics of competency-based training programs**

Competency-based training is characterized by several important distinguishing factors than the traditional development programs. Some of these characteristics and which we take into consideration when designing our curriculum are:

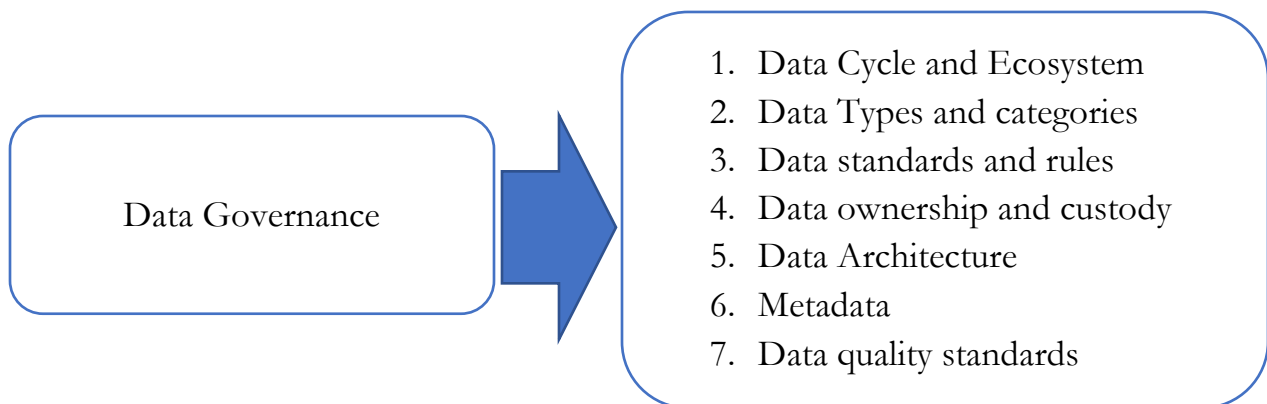
1. Theory is integrated with skill practice
2. Training and development programs are mapped to the competencies
3. Participants' knowledge and skills are assessed before the program so that they are allocated to the most appropriate programs
4. Learning can be self-paced
5. Training approaches are flexible
6. Key supporting materials are supplemented

## Design of learning programs

The new competency framework provides for 4 clusters of development programs, each of the clusters is further divided into broad topics each encompassing several areas of knowledge and skills. The four clusters are presented in the diagram below.

Data	Statistics	FORESIGHTS AND INSIGHTS	DISSEMINATION
<ul style="list-style-type: none"><li>▪ Data governance</li><li>▪ Data Management</li><li>▪ Data manipulation</li><li>▪ Data communication and visualization</li><li>▪ Data analysis and modelling</li><li>▪ Data access and security</li></ul>	<ul style="list-style-type: none"><li>▪ Statistical ecosystem</li><li>▪ Domain competency</li><li>▪ Principles of statistics</li><li>▪ Product planning</li><li>▪ Quality standards</li><li>▪ Quality control</li><li>▪ Product design &amp; development</li><li>▪ Analysis &amp; Interpretation</li></ul>	<ul style="list-style-type: none"><li>▪ Using research</li><li>▪ Product planning</li><li>▪ Analytical modelling</li><li>▪ Domain competency</li><li>▪ Product design and development</li><li>▪ Portfolio management</li></ul>	<ul style="list-style-type: none"><li>▪ Dissemination cycle</li><li>▪ Content and visualization</li><li>▪ Customer Centricity</li><li>▪ Publication</li></ul>

Each knowledge area is then further divided into several sub-areas, and programs are designed based on those. For example, data governance is broken down into:



Definitions of the knowledge required to master for each of the sub-areas are available making the design of the program rather straight forward. However, and as mentioned previously, the programs can be self-paced and flexible, it is then imperative to satisfy these conditions which are characteristics of a competency-based module.

## **Traditional Classroom learning**

Our training programs are designed to be modular in nature, each of the programs can range in duration from 2 hours to two days. This allows learners minimum absence from work and opportunity to attend the programs that are relevant to their needs and that are based on their development plans. The programs are designed to integrate theory with skill practice where not modules have technology elements associated with them. STI works with stakeholders to provide specific new learning required for certain projects or learning designed for new joiners to help align them quickly with the knowledge and skills at SCAD.

## **Self-paced learning and flexible approaches**

Some of the knowledge areas are theoretical in nature, so we decided to introduce self-paced learning as one of the approaches to the development. These self-paced programs include knowledge assessments at different intervals throughout the programs to ensure the acquisition and retention of knowledge. We rely mostly on two sources for self-paced knowledge programs:

1. Third party off the shelf programs
2. STI's in-house developed programs

Several third-party providers such as US-based universities and other data-science specific platforms provide high quality self-paced learning programs. Such programs as Data, ethics or introduction to Data Science are provided in the self-paced format as part of training allocation for employees. On the other hand, STI continue to work on developing their own self-paced programs in collaboration with internal subject matter experts. Recently, STI finalized the design of “field survey certification” program which is now delivered through an internal learning management system. The program includes several in-module tests, and the candidates have to sit for a final test proctored by STI staff.

## **Assessment of competence**

All employees at SCAD were assessed on both the behavioral and the technical dimensions. The assessment took place in three different forms:

1. Face to face interviews with SMEs
2. Self-reporting assessments where the employees evaluated their knowledge in statistics and data science



3. Knowledge tests where the candidates were asked to answer technical questions in their respective fields.

The results of the assessments were compiled and were used to allocate candidates into the various programs based on their job profiles.

## **Other forms of learning support**

### **1. Data Talk**

Data Talk is a quarterly initiative designed by STI to disseminate new knowledge and practices within the statistical and data ecosystems within Abu Dhabi and the UAE. The Data Talk hosts international practitioners and SMEs who share their experience and knowledge.

### **2. Communities of practice**

These are communities of government and private sector employees who work within the ecosystem of data and statistics. They engage quarterly to share knowledge, attend a lecture or participate in various learning activities such as workshops with international practitioners. We are currently in the process of creating further more specialized communities of practices such Business intelligence COP, Data Governance COP, MetaData COP, etc..

### **3. Professional certifications**

Several professional certifications in the field of data science are available for employees within the Abu Dhabi statistical ecosystem and we are looking to expand the provision further to other emirates in the UAE.

## **What we have accomplished so far**

Our library of training programs includes 56 workshops which are designed in collaboration with education partners, in addition to over 300 self-paced learning programs. We also provide 8 professional certifications in collaboration with international awarding bodies and are looking to design new professional certification in the future. Our training programs were provided to 620 employees from 29 government entities in Abu Dhabi and 5 entities from other emirates. We measure the success of our approach with a relevance index which measures the learners' perception of how relevant is a program to their work and whether they

will use the learning they received in the workplace. The current level of the index is 97%.