	ANNEX 3.9 **Terms of Reference** **Statistics databases, Analysis and Modelling**	ORIGIN AFPE6/AFPE
		NUMBER 9/2016
		DATE 25/07/2016

This document sets forth the Terms of Reference for the planning, development and implementation of a Course (hereinafter referred to as "the Course") in "Statistics databases, Analysis and Modelling" to the Brazilian National Telecommunications Agency (hereinafter referred to as "Anatel" or "the Agency") and other public officials, by means of this relevant service as detailed hereinafter.

1. INTRODUCTION

Anatel has the constitutional role to organize the telecommunications services in Brazil. Nowadays, Anatel is facing many challenges such as the lack of experience of the labor market in Brazil, especially in relation to telecommunications services regulation; the necessity of ready adjustment of the preexistent regulation to the technological advances; high society expectations; as well as shortage of information on the regulated market behavior and other actions supported fundamentally by technology and industrial development. Therefore, such scenery enforces public officials to continuously update knowledge and innovation in order to promote regulatory process improvement in accordance to Federal Government policies.

It is of utmost importance for Anatel to provide adequate training to its employees. The Agency's capacity building programme aims at improving Brazilian regulator's response to society's yearnings for better services, enabling their follow up on technology evolution of the sector, as well as to allow continuous improvement of work processes in order to ensure the desired results

Thence, Anatel is constantly concerned about investing in training programs that will comply not only with the demands of technical needs, but also with those that can, in any way, broaden the horizon and the capacity of the Agency's employees, technicians and managers, to find innovative and creative solutions, promote interpersonal relationship, improve latent or potential skills that will enable them to develop durable core competences applied to each different role within the organization, especially in times of change. Furthermore, it will provide technical, managerial and operational conditions so that tasks' development is consistent with the Agency's regulatory role.

2. OBJECTIVE

The main objective is to hire specialized service to deliver a Course on Statistics databases, Analysis and Modelling for up to 30 (thirty) participants that shall be indicated by Anatel to participate in the Course.

The Course proposal shall consider a 3 (three)-week period for delivery.

The planning, development and implementation of the Course shall focus on the following main topics, distributed in 2 (two) different modules:
2.1 MODULE 1 – STATISTICS THEORY LEVELING (Fundamental concepts / Basic Statistics):

1) What is Statistics?
2) Terms: Variable, Measurement scales (nominal, ordinal, interval), Random variable, Population, Sample, Parameters, Estimators (Vicious and Non-vicious)
3) Descriptive and Inferential Statistics
4) Basic measures: Mean, Median, Mode, Variance, Standard Deviation, Percentiles, Variation coefficient, Asymmetry, kurtosis, etc.
5) Data exploratory analysis for outliers detection and missing data treatment
6) Association measurements between two variables: covariance and correlation
7) Graphics: Dispersion, Histograms, Bubble Plot, Box-Plot, Matrix, etc.
8) Probabilities distribution
9) Probabilities distribution - Overview
10) Normal distribution
11) Inference
12) Sampling topics
13) Precision and accuracy of parameter estimators
14) Hypothesis testing
15) Confidence level, significance level, p-value, etc.
16) Analysis of Variance (ANOVA)
17) ANOVA with one, two or more factors
18) Descriptive measures and association between categorical variables

2.2 MODULE 2 – ANALYSIS AND ADVANCED MODELLING STATISTICS TOOL

1) Getting familiar with SAS system
2) Getting familiar with SAS Data Sets
3) Generating simple reports
4) Improving output
5) Creating SAS Data Sets
6) Programming Data Steps
7) Combining SAS Data Sets
8) Generating summarized reports
9) Introduction to graphics
10) Controlling Input and output
11) Summarizing data
12) Reading and recording different types of data
13) Transforming data
14) Processing data interactively
15) What is Data Mining?
16) Data visualization: Dispersion graphics, histograms, Box-Plot, Matrix, etc.
17) Overfitting (what it is, how to minimize it)
18) Oversampling (what it is, how and when to implement)
19) Cross-Validation (what it is, how and when to implement)
20) Decision trees
21) Models selection (Chi-Square, Gini, Entropy, F-test)
22) Simple and multiple linear regression
23) Results: concepts, applications and interpretation
24) Simple and multiple logistic regression
25) Results: concepts, applications and interpretation

26) Clusters analysis:
  a. Hierarchical Clustering: types, distance measures, support graphics, result interpretation
  b. Non-hierarchical clustering: concepts and result interpretation

3. PRODUCTS

PHASE I

3.1. Planning and Development

The planning and development of this Course shall consider a three-week Course, with a duration of at least 100 (one hundred) hours and 30 (thirty) participants.

3.1.1 Planning:

The Product shall present at least:

a) A general description of the Course and its subject;
b) The detailed methodology that will be used for the implementation of the Course;
c) Proposed schedule of Course implementation;
d) Detailed qualification of professionals involved;
e) Proposed methodology for assessing knowledge transmission (submit model of a questionnaire or any other evaluation instrument proposed);
f) Detailing of the necessary infrastructure for the implementation of the Course, considering that it shall be delivered in Brasilia.

3.1.2 Development:

The Product shall present:

a) A brief description of all instructional material for Course delivery;
b) Copy of all materials to be used in classroom by participants;
c) Bibliography quoted and / or used for the development of all instructional material.

The development of the programmatic content shall consider the minimum content established below:

Subject	Duration (hours)
Module 1 - Statistics theory leveling	To be defined in the proposal
Module 2 - Analysis and advanced modelling statistics tool	To be defined in the proposal
Total	100

PHASE II

3.2. Course Delivery

The Course on "Statistics databases, Analysis and Modelling" aims at providing advanced knowledge on Statistics theory, its concepts, graphics and measures, and on Statistics tools, in order to obtain different reports and perform data analysis.

After the delivery of the Course, participants are expected to have advanced knowledge on the two modules described in Session 2 - OBJECTIVE.

Anatel expects that the instrument proposed to assess knowledge transmission and instructors' performance is applied at the end of the Course.

PHASE III

3.3. Reporting and Evaluation

3.3.1. The corresponding certificates (considering compliance with minimum attendance required) shall be delivered to Anatel and not to participants (Anatel may decide to organize a specific ceremony for this purpose).

3.3.2. A Course Completion Report shall be delivered indicating (i) problems faced and solutions adopted; (ii) compilation of results related to the knowledge transmission assessment.

4. STAGES OF IMPLEMENTATION AND DEADLINES

PHASE	PRODUCT	DELIVERY	DEADLINE
I	Product 3.1	Planning of the Course*	To be defined
		Course Content*	To be defined
II	Product 3.2	Course delivery	To be defined
		Knowledge transmission assessment	To be defined
III	Product 3.3	Issuance and delivery of Certificates to Anatel	To be defined
		Delivery of Course Completion Report	To be defined

* For Anatel' and ITU's Approval

5. METHODOLOGY

The Course is to be delivered in Brasilia for up to 30 (thirty) participants. The Contractor shall consider the following methodological aspects:

- All instructional material shall be of high quality, in Portuguese, with no grammar or vocabulary errors;

- The language used for delivery and evaluation of the course shall be the Portuguese language. The language used for planning and development shall be either the English language or the Portuguese language;

- The Course content shall be developed in electronic media, and supported by specific instructional resources, such as multimedia presentations, and others;

- Discussions shall be conducted to ensure the level of knowledge to be achieved for each topic;

- The practice of discussing case studies and critical thinking motivating tasks with indicative of solutions or improvement should be encouraged;

- During the delivery of the Course, the instructor shall avoid value judgments beyond

technical connotation;

- Participants will be allowed a maximum of 25 (twenty-five percent) of absence with reasonable justification, subject to the acceptance by Anatel;

- All documents arising from this Terms of Reference shall be delivered in print, properly bound, and electronically, using Microsoft and Adobe archive's formats.

6. QUALIFICATION OF THE PROFESSIONAL WHO WILL DELIVER THE COURSE

The CV of proposed professional shall at least include the following information:

- formal education and training schools;
- Instructor's experience expressed in time (e.g. years of experience in classroom);
- length of service provided for the company;
- previous work experience; and
- areas of expertise.

7. WHAT IS EXPECTED FROM THE CONTRACTOR

The Contractor shall:

- provide human and material resources such as the Course venue, and all facilities mentioned by the Contractor in the offer presented such as multimedia equipment and other devices that may be necessary;
- develop all instructional materials and provide any other that may be necessary and indispensable for Course implementation in accordance to proposed methodology;
- provide to participants access to all supporting materials such as lecture notes, handouts or books;
- assess instructor's performance and knowledge transmission;
- issue Course completion certificate;
- perform training as contracted and specified herein;
- report to Anatel and ITU any problems occurred during Course implementation and others related to the participants;
- assume the expenses necessary to the development of the three phases of the Course, including those related to the Instructor's remuneration, accommodation, food and displacement, with the exception of those specified in Session 8 – WHAT IS EXPECTED FROM ANATEL and those related to participants' remuneration, accommodation, food and displacement.

8. WHAT IS EXPECTED FROM ANATEL

Anatel shall:

- if required, provide to participants access to specific information under the proprietorship of the Agency;
- control participants attendance based on the information provided by the Instructor and guidelines presented in Session 5 – METHODOLOGY.