

The role of testing laboratories to an ICT conformity assessment system.

*TRANSFORMANDO
EM REALIDADE*

ITU - C&I Training on Conformity and Interoperability – June/2015

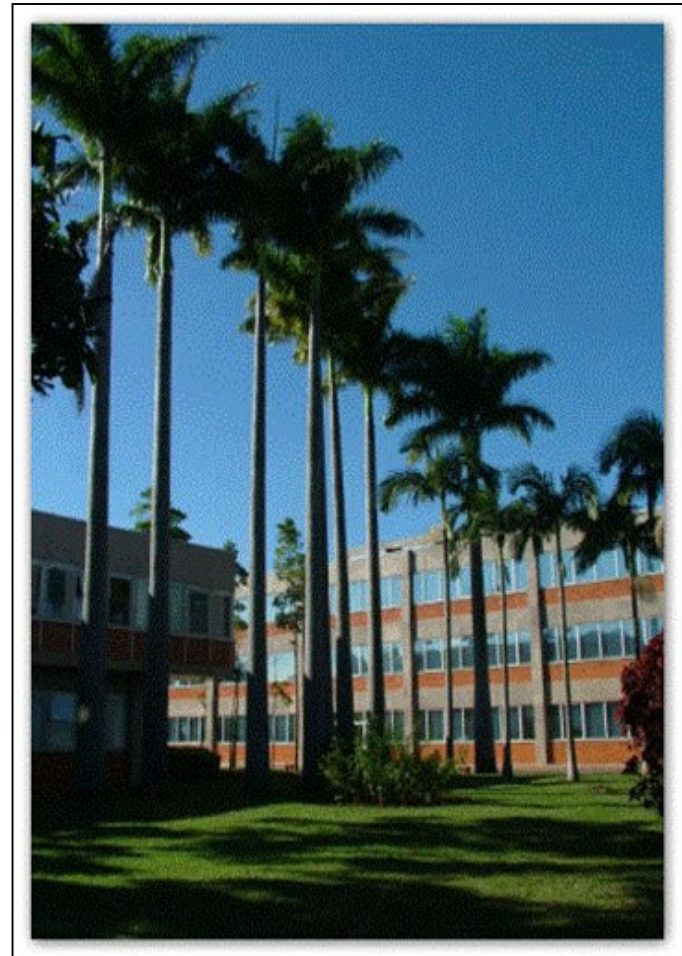
AGENDA

- Introduction
- Test Laboratory – Importance
- Laboratory Organization and Management
- Investment and Cost Estimation
- Good Laboratory Practice
- CPqD's Laboratory Facilities
- Anatel Regulatory Framework
- The CPqD and ITU Cooperation – C&I
- Final Remarks

Introduction

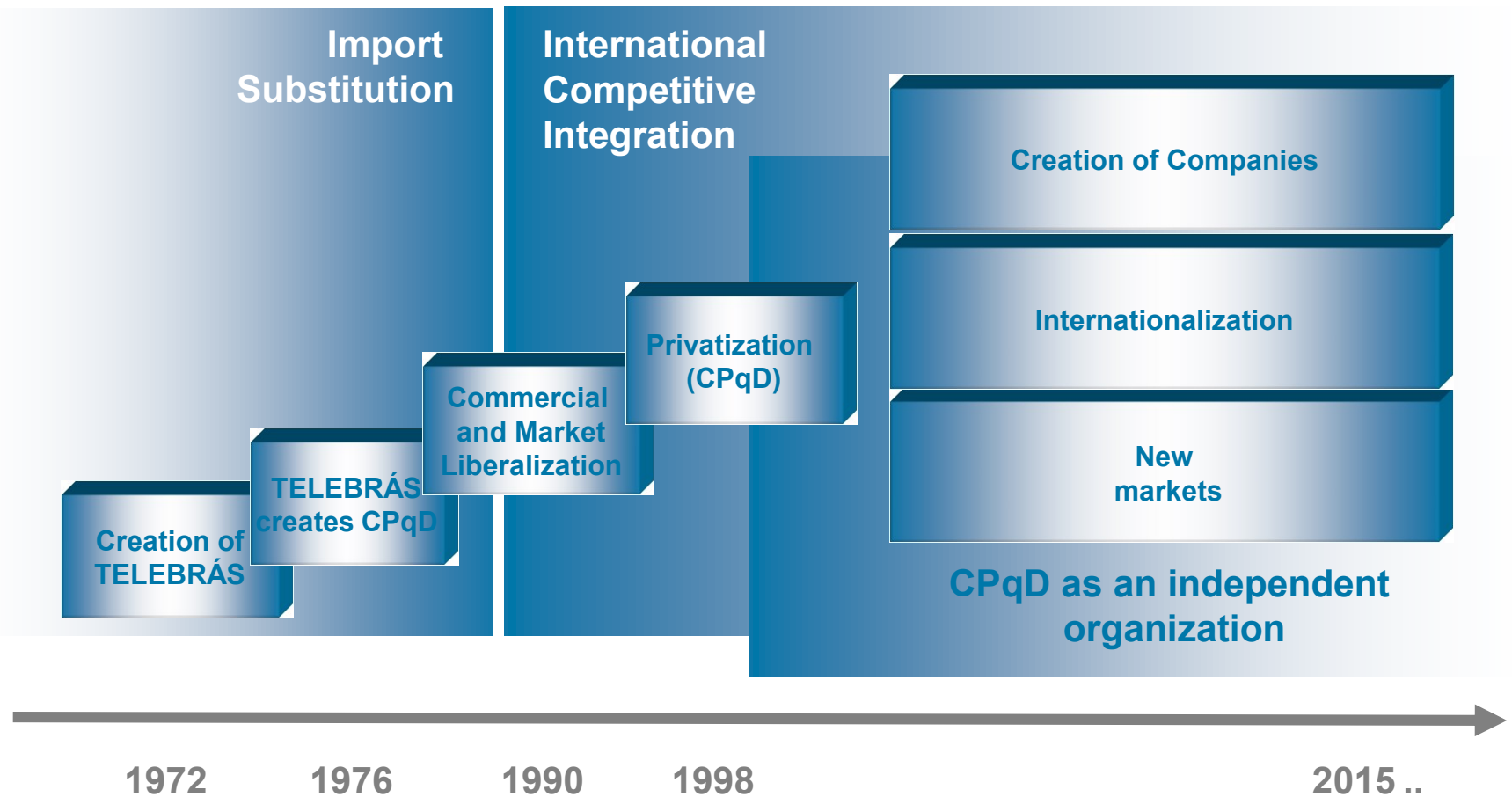
- This presentation aims to show an overview of the importance for society in carrying out **laboratory tests aimed at conformity assessment** of telecommunications products.

CPqD



**Research and Development
Telecommunications Center**

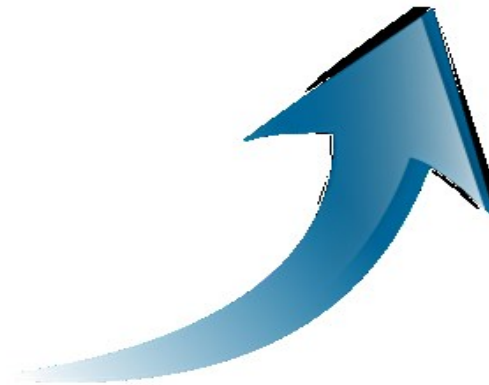
Company History and Evolution



CPqD

**Increasing client's
competitiveness and
society's digital
inclusion**

**An organization focused
on innovation through
Information and
Communication
Technologies (ICT)**



Aiming at

Benefits for Society



Intellectual Capital

Job Creation

Bargaining Power

Digital Inclusion

Wealth Generation

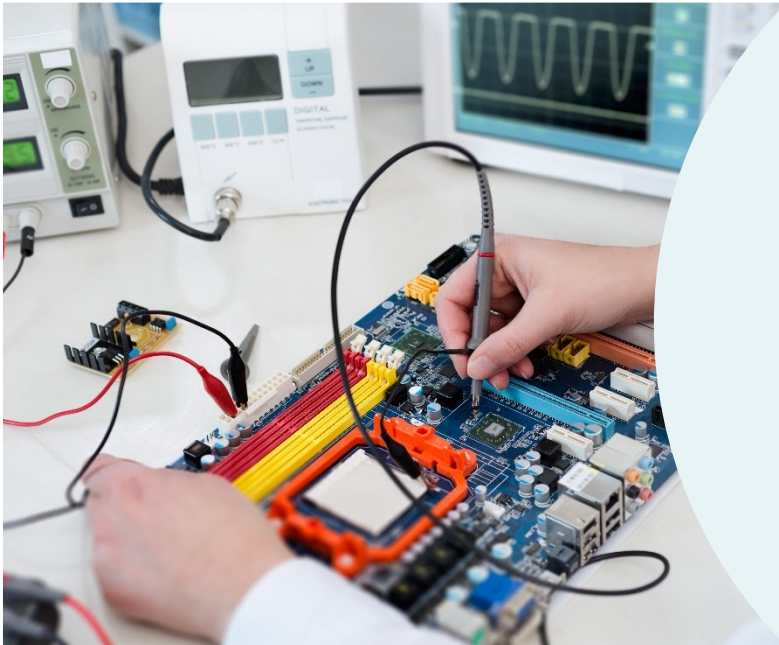
TEST LABORATORY – IMPORTANCE

The Importance of a Test Laboratory

- A local test laboratory contributes to the development of the national industry by **providing inputs that enable projects validation and improvement**. In addition, a test laboratory **promotes the growth of knowledge** and supports the regulatory agencies in the certification process.
- **Main benefits**
 - Enhances user safety and protection of consumer rights
 - Increases national industry competitiveness
 - Provides knowledge acquisition
 - Contributes to knowledge exchange programmes with universities and R&D centres
 - Ensures that products commercialized or used meet the minimum quality requirements



The Importance of a Test Laboratory

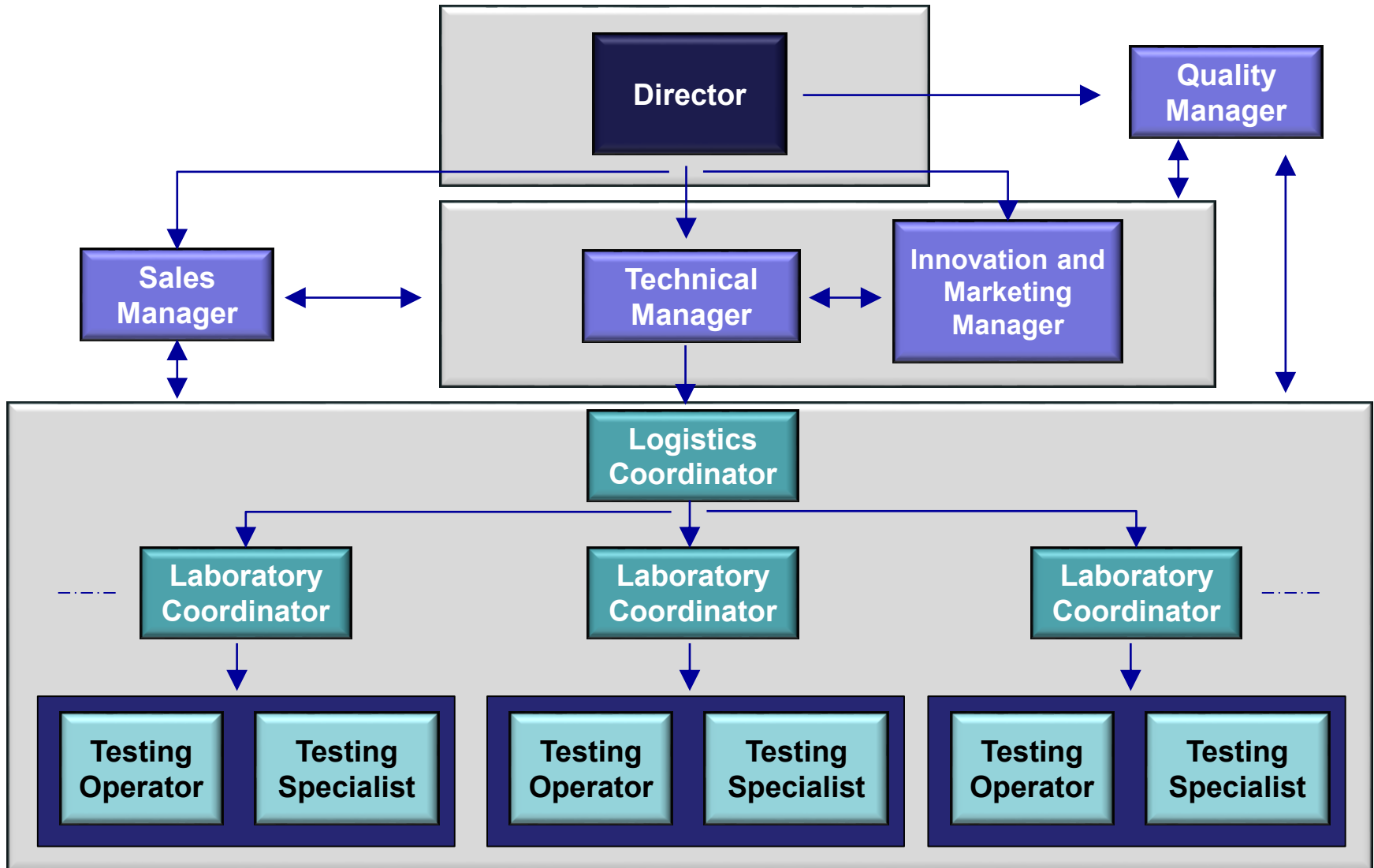


Typical Service Portfolio

- Standard conformance testing
- Product quality assessment
- Tests to support the operator procurement process
- Interference analysis of communication systems
- Consultancy for the development of new products
- Calibration of optical/electrical equipment

LABORATORY ORGANIZATION AND MANAGEMENT

Laboratory Organization and Management



Laboratory Organization and Management – Roles/Responsibilities

- Director
 - Overall responsibility for the **management and development** of the test laboratory.
- Quality Manager
 - **Establish quality policies**, make sure day-to-day lab activities **comply with ISO/IEC 17025 requirements**, identify new accreditation needs and organize inter-laboratory tests.
- Technical Manager
 - Manage and **develop human resources, provide infrastructure and elaborate investment strategies** based on marketing studies.
- Innovation and Marketing Manager
 - Map market and competitors, **identify new opportunities** and customer needs, and analyse/indicate investment priorities.

Laboratory Organization and Management – Roles/Responsibilities

- Sales Manager
 - **Manage the sales team** and define cost and market-based pricing.
- Logistics Coordinator
 - **Coordinate the logistics team** – sample receipt and tracking within testing centre.
- Laboratory Coordinator
 - Coordinate (schedule and work shifts) and **supervise testing activities** performed by his/her team, in compliance with quality standards and meeting customer requirements.
- Testing Specialist
 - Develop and **implement new testing services** in compliance with quality standards, and provide training.
- Testing Operator
 - **Execute the test** campaign activity.

Laboratory Organization and Management

- Management – Periodical Reporting Session
 - **A recommended procedure** to be adopted in order to efficiently manage the test laboratory **is to conduct periodic follow-up reviews**, under the director's leadership, to assess and report on progress and completion of different activities:
- Supervise laboratory service sales
- Supervise market demands
- Verify the need to hire more staff and have more investments
- Elucidate critical points concerning technical and management processes



Human Resources – Profiles and Skills

Technical Manager

- **People management**, activity planning and monitoring, business plan development, cost and budget planning, negotiation skills, understanding of business trends (market, regulatory and political), equipment/technology expertise, knowledge of quality standards and basic knowledge of foreign languages (English/Spanish).

Laboratory Coordinator

- **Strong ability to coordinate teams** and monitor activities, knowledge of quality standards, test methodology, test report analysis, elaboration of technical proposals, management reports, workflows, knowledge of Good Laboratory Practice (GLP), technology expertise.

Testing Specialist

- **Strong ability to train people**, high level of technology/equipment expertise, excellent operational skills, use of statistical techniques, test methodology development, interpretation of test standards.

Testing Operator

- **Test methodology, elaboration of test reports**, interpretation of test standards, knowledge of Good Laboratory Practice (GLP), technology/equipment expertise, operational skills, basic knowledge of quality standards and statistical techniques.

INVESTMENT AND COST ESTIMATION

Investment and Cost Estimation

- The investment required (CAPEX) to implement a testing centre is significant. In general, components that require greater investment are:



- Instrument Asset
- Laboratory Facilities
 - Laboratory rooms, offices and meeting rooms
 - IT infrastructure
 - Air conditioning system
 - Security system
 - Parking area
 - Canteen and restaurants
 - Common areas
- Human Resources
 - Hiring specialized personnel
 - Training

Investment and Cost Estimation

- The costs to maintain (OPEX) a testing centre are mainly composed of:
 - Payroll
 - Training
 - Equipment calibration
 - Equipment maintenance
 - Equipment upgrade
 - Location rent
 - Audit
 - Utilities
- There are two main ways for addressing the high investment issue:
 - Public-private partnerships
 - Partnership between countries

Investment and Cost Estimation

- Investment and cost estimation to implement an infrastructure for mobile devices type approval tests

Laboratory	m ²	Instrument Asset [EUR]	Number of staff	Personnel [EUR/year]	Instrument Opex [EUR/year]	Location Rent [EUR/year]	Utility [EUR/year]
EMC	300	1.600.000	5	350.000	5.000	39.000	56.000
Radio Signalling	250	2.000.000	12	840.000	10.000	32.000	46.000
Safety	80	1.200.000	4	280.000	25.000	10.000	15.000
SAR	150	800.000	4	280.000	25.000	19.000	28.000
Management			5	350.000			
Other activities (*)			12	840.000			
Total	780	<u>5.600.000</u>	42	<u>2.940.000</u>	<u>65.000</u>	<u>100.000</u>	<u>145.000</u>
		<u>USD 7.000.000</u>		<u>USD 3.700.000</u>	<u>USD 82.000</u>	<u>USD 125.000</u>	<u>USD 182.000</u>

(*) Other activities: Security, maintenance, sales, logistics, ICT management, quality, secretariat

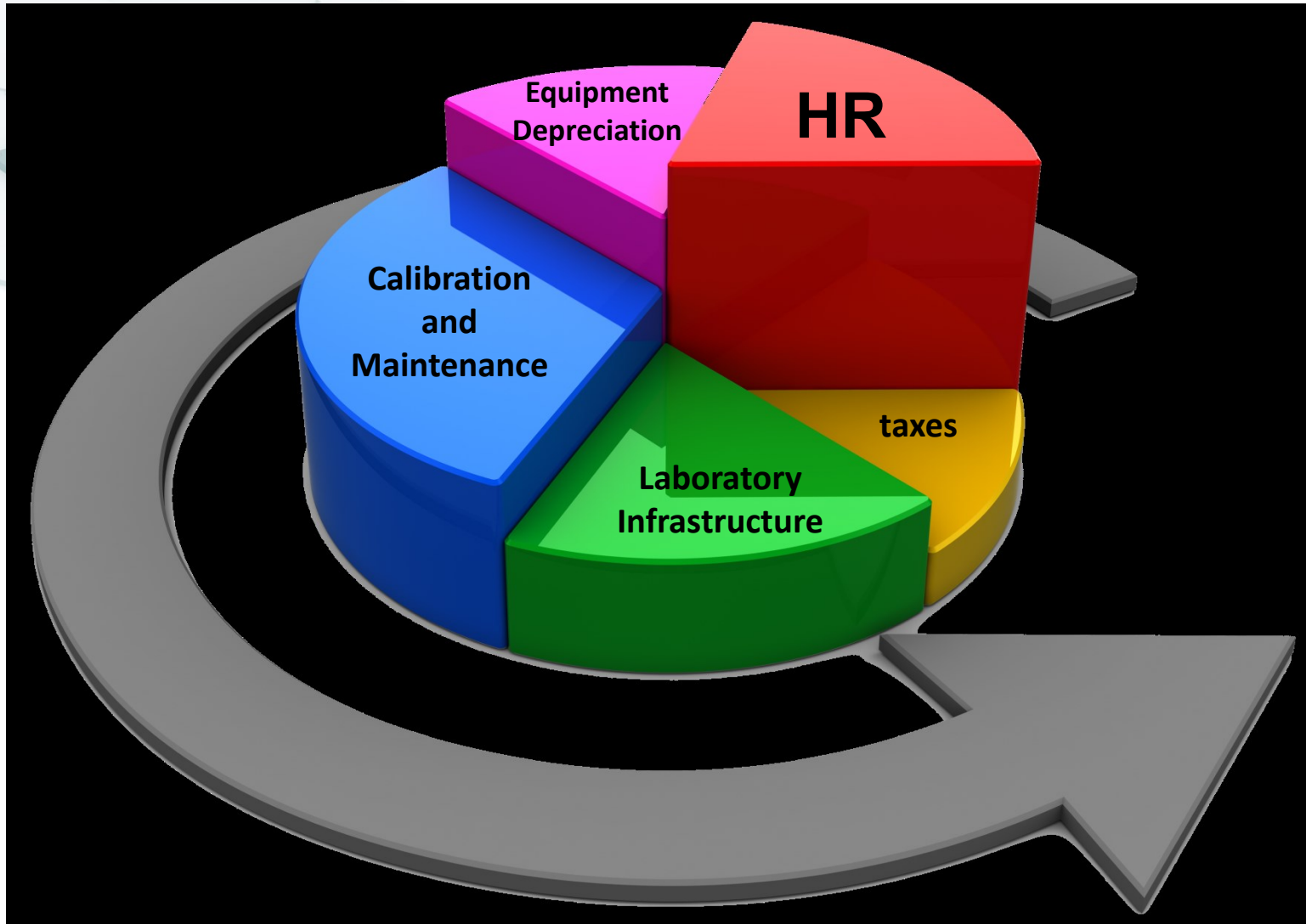
Source: Adapted from *Feasibility study for a conformance testing centre – ITU – December 2013*

Investment and Cost Estimation

- **Process optimization** for operation/costs reduction
 - Automated test execution and report
 - Use the infrastructure 24 hours per day (more than one shift per day)
 - Instrumentation duplication
- **Investment priorities**
 - Target **investment on new instruments** based on the market needs
 - Consider the total cost of ownership (not only the instrument price/initial cost) before purchasing a new instrument

Composition of the costs charged to the tests

› Testing of costs in Brazil



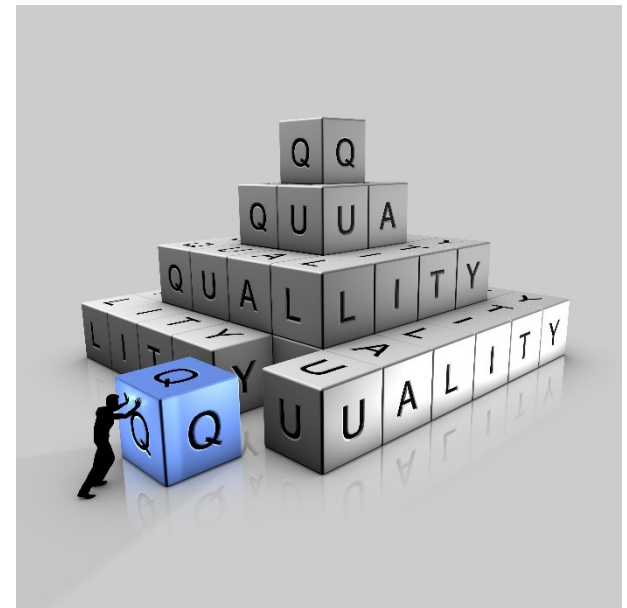
GOOD LABORATORY PRACTICE - GLP

Good Laboratory Practice (GLP)

- GLP is a set of recommended activities to ensure the **quality and reliability of test results**
 - Factors contributing to the **reliability** of results
 - Human factors
 - Accommodation and environmental conditions
 - Test, calibration and validation methods
 - Measurement traceability
 - Sampling
 - Handling of test and calibration items
 - **Quality** control procedures
 - Between calibration intervals, perform periodic measurements to monitor equipment performance (control chart)
 - Compare results of the same test performed by different test operators
 - Inter-laboratory comparison of test results

Good Laboratory Practice (GLP)

- To meet the requirements of ISO/IEC 17025, the laboratory shall establish and maintain procedures for:
 - Management system
 - Document control
 - Identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records
 - Selection and purchasing of services and supplies
 - Implementing corrective actions when non-conformity is identified



Good Laboratory Practice (GLP)

- The laboratory shall:
 - Continually **improve its management system**
 - Periodically conduct **internal audits** of its activities
 - **Be independent** of any companies – guaranteeing its impartiality as a third-party provider of conformance testing services
 - Ensure the protection of its customers' **confidential information** and proprietary rights (including protection of electronic storage and results transmission)

Challenges

- Fast development of technologies
 - High investment to maintain laboratories infrastructure updated
 - Difficulty in maintaining standards and technical requirements updated
 - Difficulty in maintaining technical knowledge updated
- Surveillance to avoid the use of counterfeits or products not homologated/approved by ANATEL.



• Historical – accredited Tests

2002-2003 - accreditation of **22 tests** for optical cables;

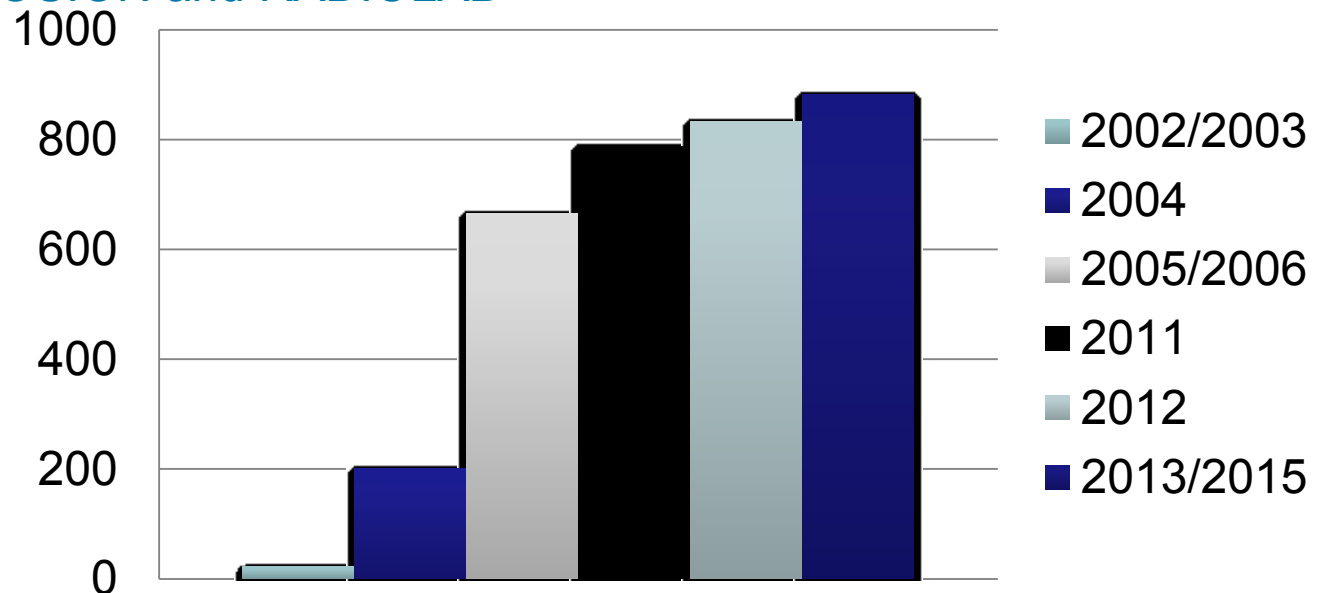
2004 - **201 accredited tests** for the following labs: EMC, SAFETY, WDM,RADIOLAB, ANTENNA, ABSORPTION and, MATERIALS;

2005 – 2006 - **665 accredited tests** for the following labs: EMC, SAFETY, ENERGY, RADIOLAB, ANTENNA, TERMINALS, ABSORTION;

2011 - **787 accredited tests** for the following labs: RADIOLAB, CORROSION

2012 - **833 accredited tests** for the following labs: ensaios acreditados: EMC, ENERGY and TERMINALS;

2013 – 2015 - **882 accredited tests** for the following labs: ENERGY, MATERIALS, CORROSION and RADIOLAB



CPqD's LABORATORY FACILITIES

CPqD's Laboratory Facilities



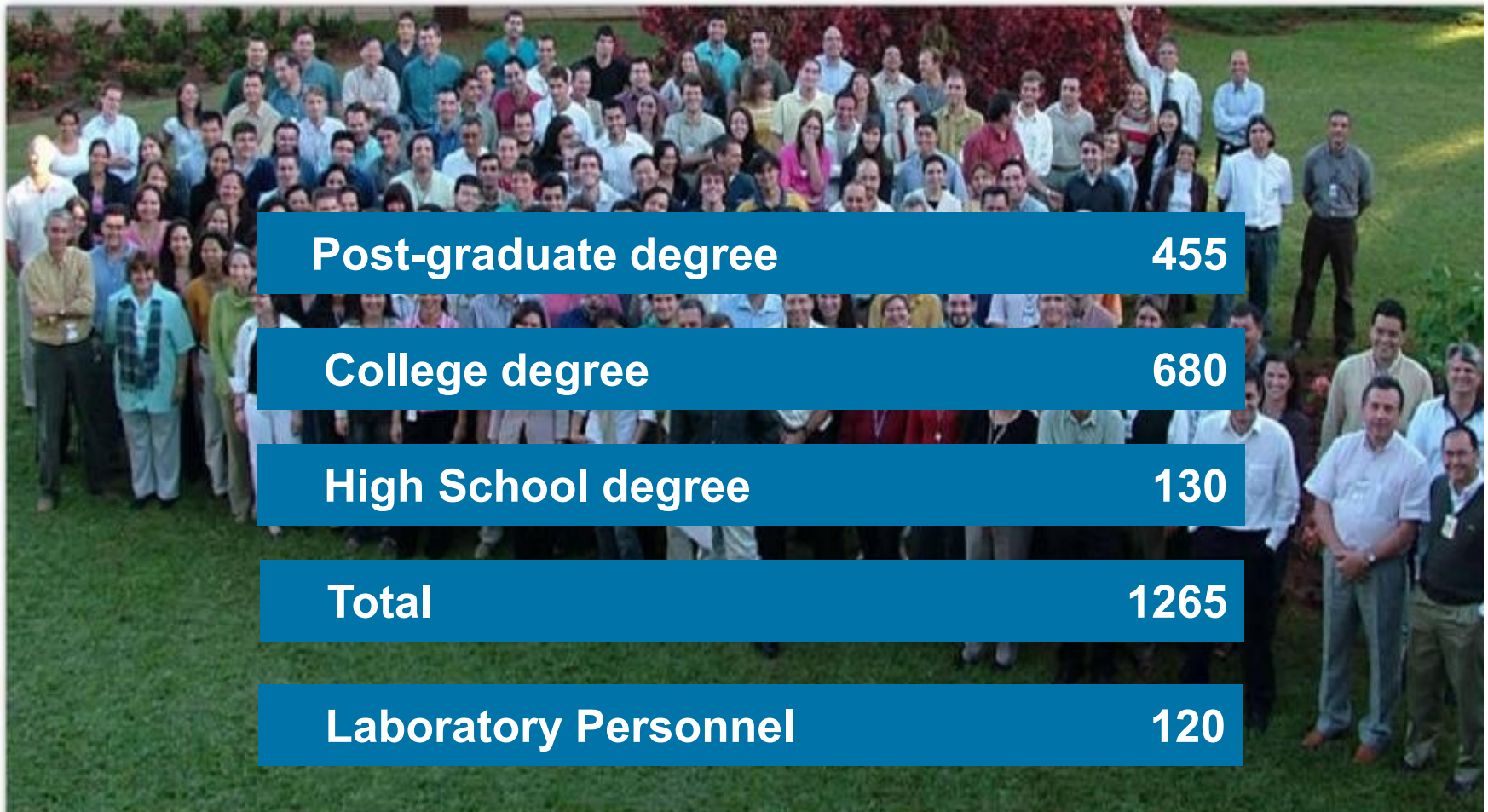
CPqD Facilities

Total area:
Over 360,000 m²

Building area:
Over 86,000 m²

Laboratory area:
Over 5,000 m²

CPqD's Laboratory Facilities



CPqD's Laboratory Facilities

ISO/IEC 17025 / ISO 9001 / ISO 14001

- Acoustic
- Antennas
- Batteries
- Cables
- Colorimetry
- Corrosion
- Chemical
- Climatic
- Digital TV
- EMI/EMC
- Pre and Full Conformance – LTE and LTE-A
- Physical
- Protocol and Communication Interfaces
- Optical Fiber and Optical Equipment
- Materials
- Mechanical
- Radio and Signaling
- RFID
- Safety
- SAR
- User Experience
- Field Tests
- Calibration



**More than 850 tests
accredited by INMETRO***

CPqD's Laboratories



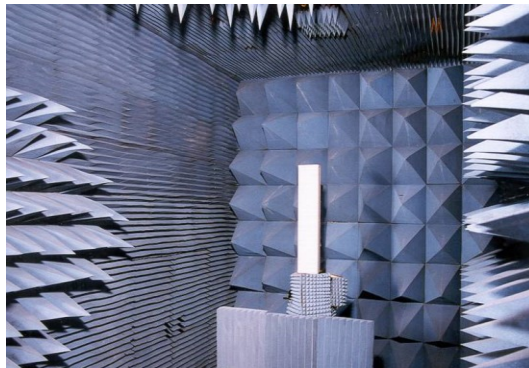
SAR



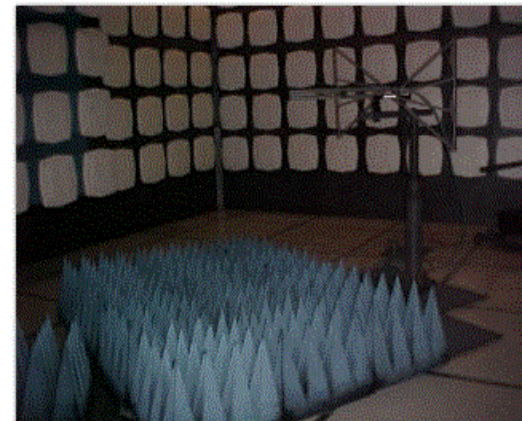
Electroacoustic



RFID



Antennas



EMI/EMC

CPqD's Laboratories



Pre and Full
Conformance
LTE and LTE-A

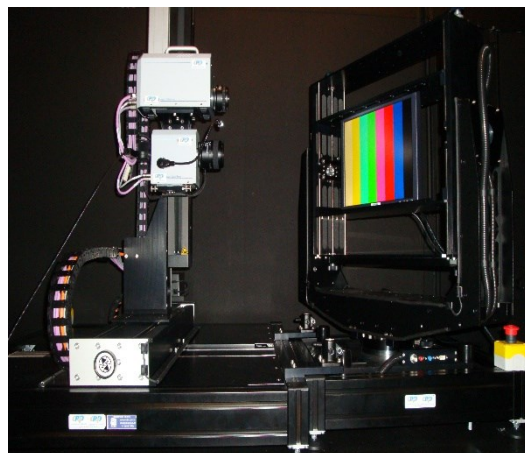


Electrical and RF

Calibration



Optical



Colorimetry

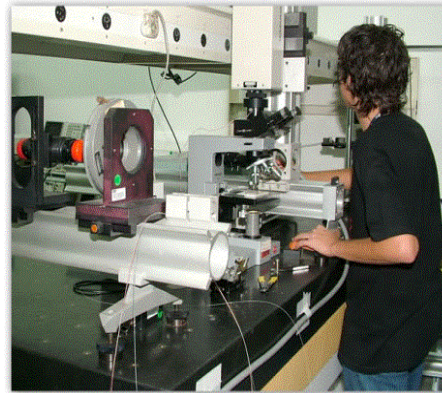


Digital TV

CPqD's Laboratories



Optical Equipment



Cables



Mechanical Tests

Climatic Tests



Temperature and Humidity Chambers

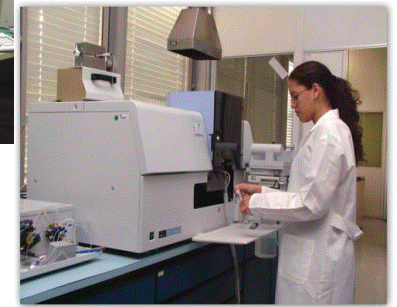


Aging chamber



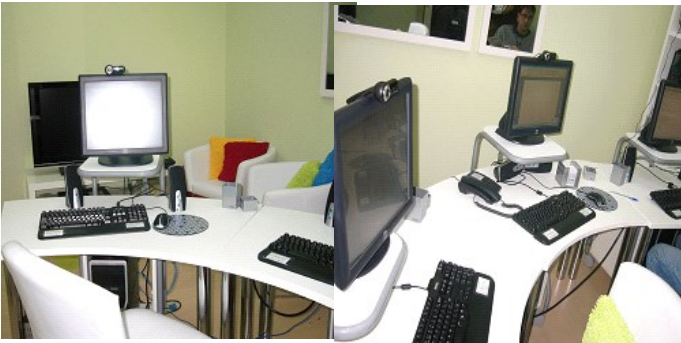
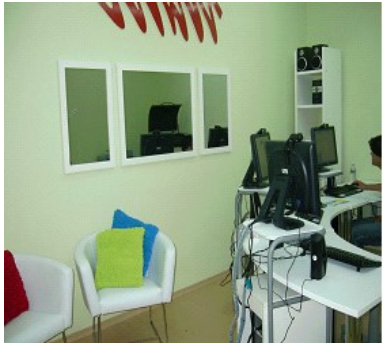
Salt Fog Chamber

CPqD's Laboratory Facilities



Batteries

Physical, Chemical,
Corrosion



User Experience

ANATEL REGULATORY FRAMEWORK

Anatel - Regulatory Framework

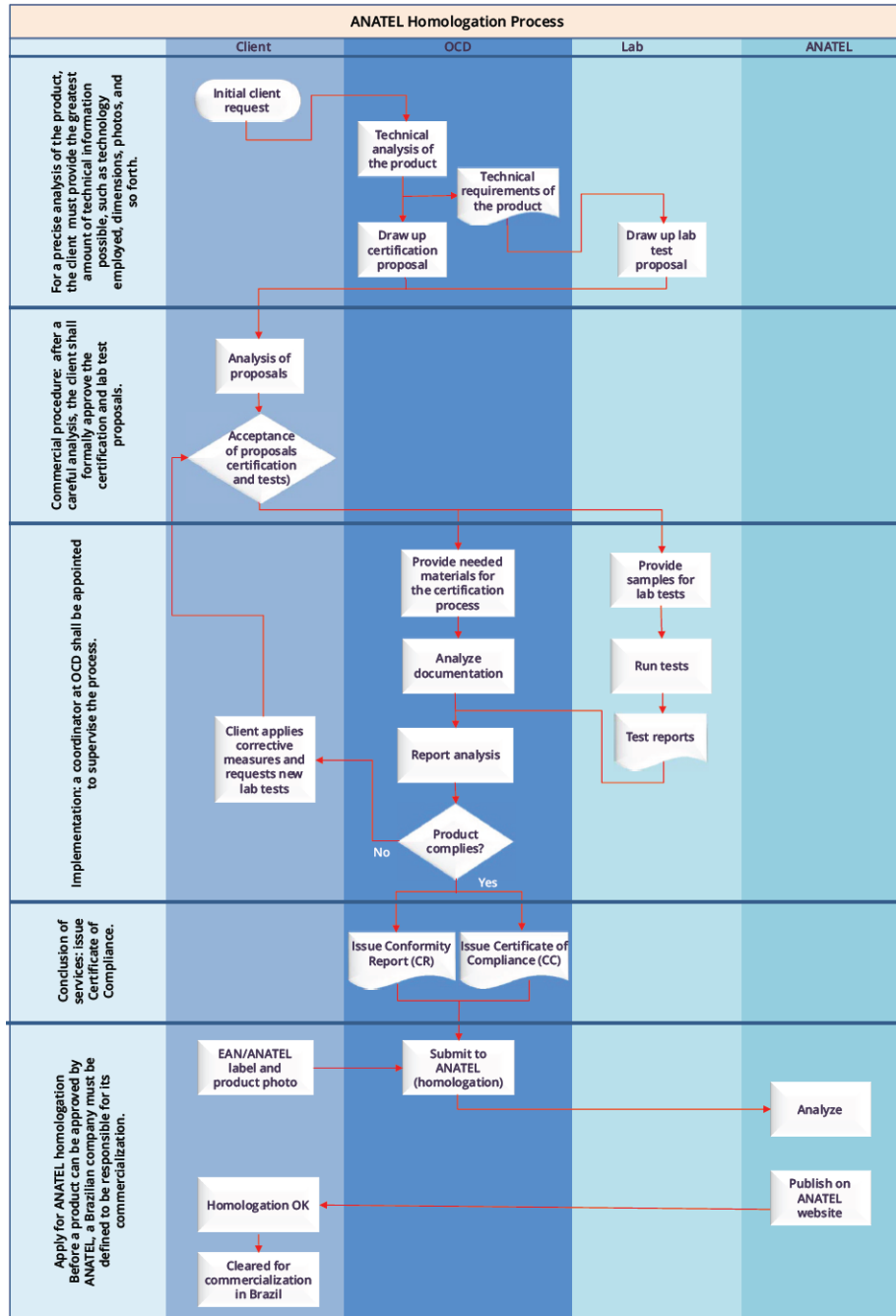
- Law 9472 (July, 1997) – General Telecommunications Law
 - ANATEL, the National Telecommunications Agency, is responsible for issuing or recognizing telecommunication product certification and for issuing norms and standards regarding equipment utilization.
- Resolution 242 (November, 2000) – Regulation on the Certification and Authorization of Telecommunications Products
 - Any telecommunications products, before they are commercialized or used in Brazil, must have a conformity certificate issued by a Designated Certification Body (OCD) and approved/homologated by ANATEL.
 - ANATEL can sign Mutual Recognition Agreements (MRA) for conformity assessment of telecommunication products, recognizing foreign certification bodies and laboratories as part of the conformity assessment process.



Agência Nacional de Telecomunicações

The Brazilian Scenario

- ANATEL has 12 designated certification bodies (OCDs)
- Currently available in Brazil for testing telecommunications products
 - 23 third-party labs
 - 18 accredited by INMETRO
 - 5 evaluated by OCD
 - 5 laboratories not operated by third parties that have been evaluated by OCD
- Priority order for choosing a test laboratory
 - 1st) Brazilian independent laboratories accredited by INMETRO and recognized by MRAs foreign laboratories
 - 2nd) Third-party laboratories that have been evaluated by OCD
 - 3rd) Laboratories not operated by third parties that have been evaluated by OCD
 - 4th) Foreign laboratories accredited by the official member body of the ILAC





The CpQD and ITU Cooperation - C&I Programme

FORMANDO
EM REALIDADE

• CPqD and ITU Cooperation

Laboratory Partner of the C&I Programme (MoU)

Mapping of test suites adopted in CPqD and relevant ITU Recommendations & normative references

Contribution to selection of the minimum set of parameters linked to interoperability performance for ITU standards

Conformity Database Promotion & Population

Participation in Capacity Building activities

Participation in ITU-D SG.2 Q.4/2, SG-5, SG-11 and ITU-T SG11 and SG-15 / Assistance in ITU interoperability events

Accreditation and certification issues

Recognition of Labs accredited to perform tests related to ITU Recommendations (category? Data base?)

Development of a general database for equipment / ITU Standard / Test suite references

FINAL REMARKS

- **For establishing and maintaining a test centre, it's necessary to consider:**
 - An established Accreditation Bodies which are signatories to ILAC
 - Example, Brazil: INMETRO – National Institute for Metrology, Standardization and Quality
www.inmetro.gov.br
- A metrology institutes to provide calibration services
- Demands for testing
 - Regulatory policy (certification and type approval; fostering human capacity in ICT technologies, etc.)
 - National industry / conformance of foreign equipment with regional/local rules
 - Network operators / quality of service to end-users
- Funding support from both public and private sectors (partnership between countries)
 - Modular approach should be persued
- Local support for equipment maintenance – local representation of equipment vendors



- **Main benefits of test laboratories:**

- Ensures that products commercialized or used in the country meet the minimum requirements (quality, safety, spectrum allocation, interoperability, etc.)
- Enhances user safety
- Makes the entry of counterfeit products in the country more difficult by establishing tool for enforcement
- Increases product quality and reliability
- Provides human knowledge acquisition (on ICT technologies, testing methodologies, equipment configuration)
- Contributes to knowledge exchange with government agencies, universities and R&D centres
- Invitation for partnership with CPqD



GRACIAS
THANK YOU

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