سلطنة عُمان
Sultanate of Oman

هيئة تنظيم الاتصالات
Telecommunications Regulatory Authority

The Role of GIS in Telecom Infrastructure Analysis

Sultanate of Oman

2025

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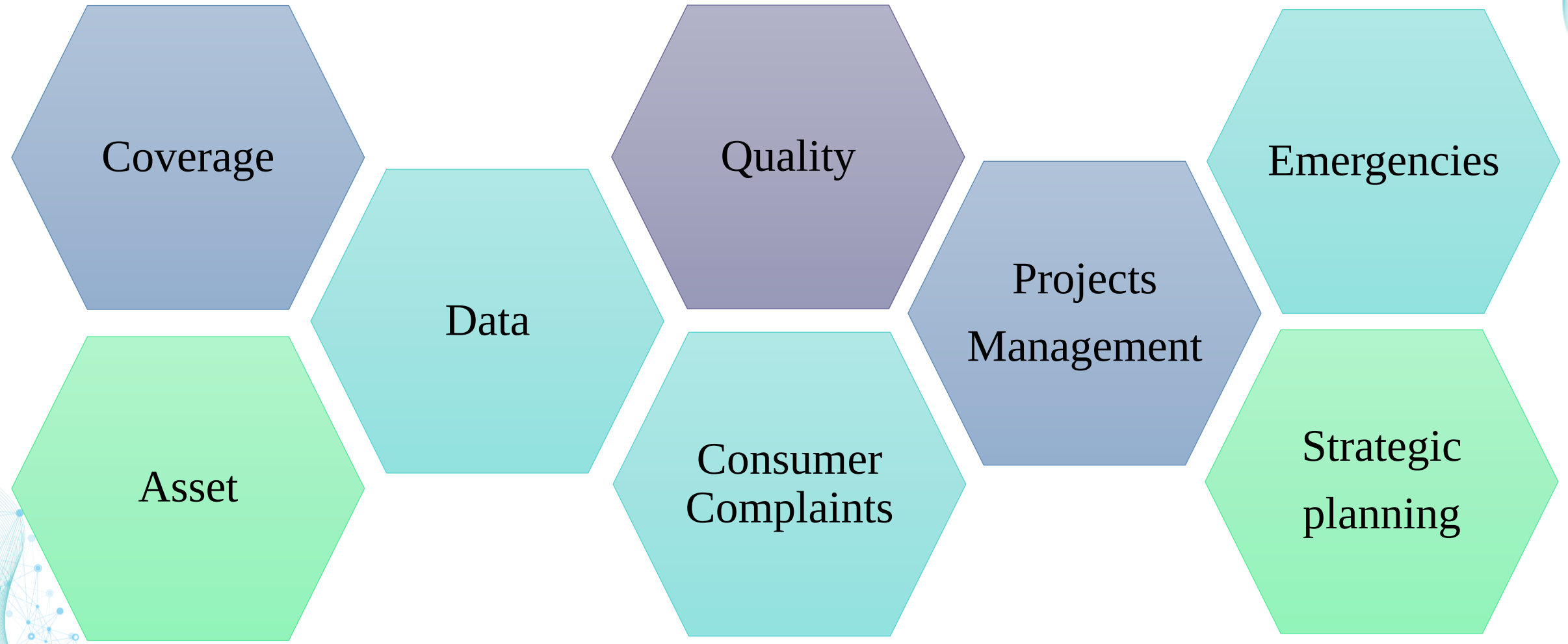
GIS practice in Oman Telecom sector

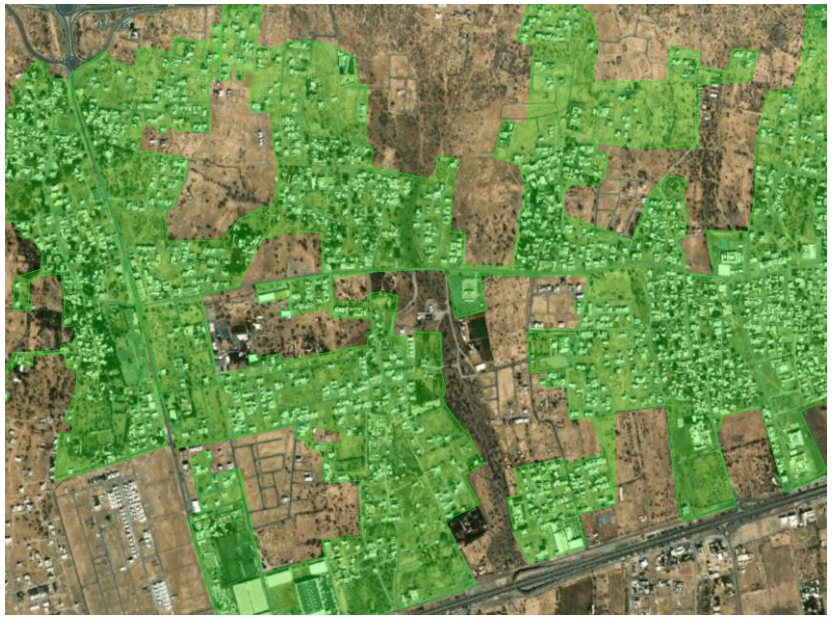


Data in GIS

Geographic Data Base:

Towers Layer

Cables Layer



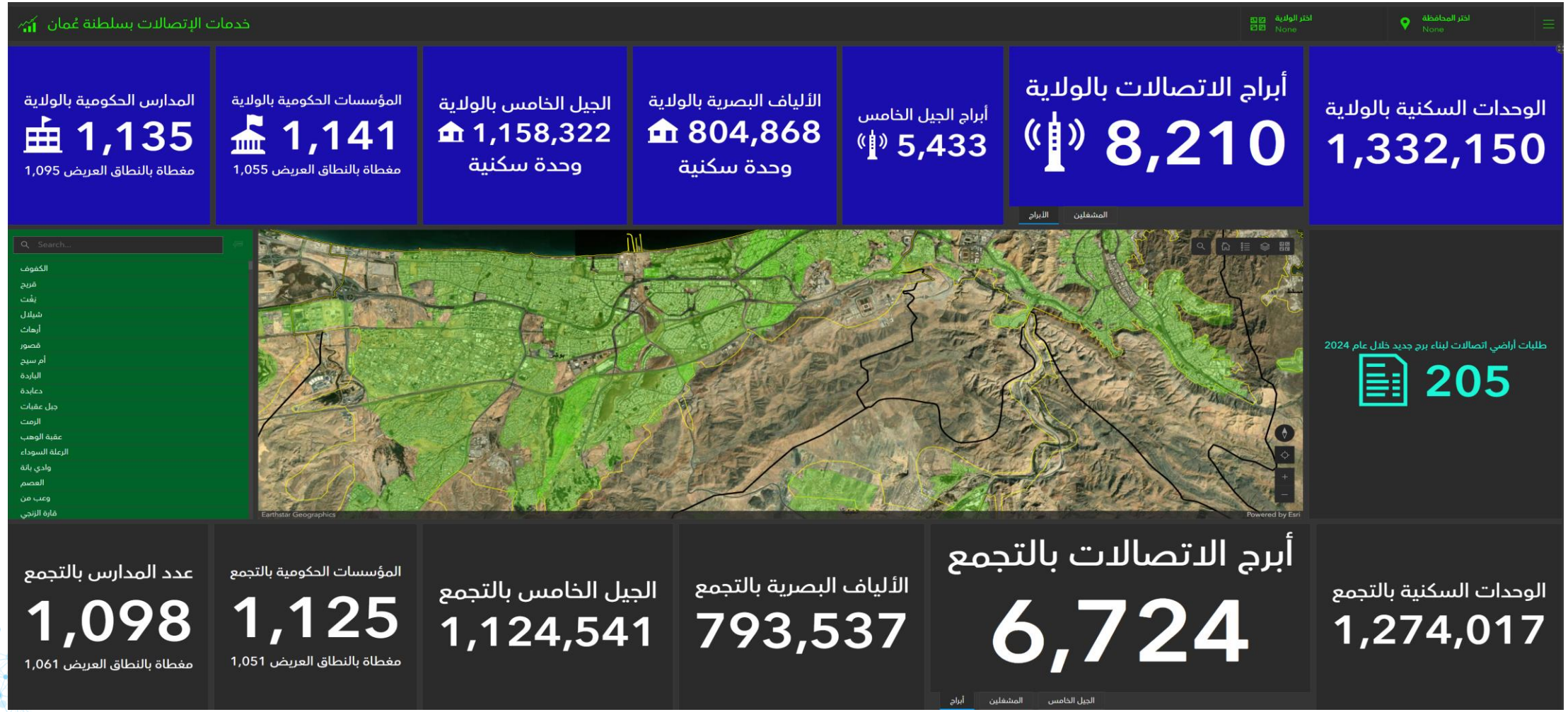
Fiber Layer

Data in GIS

Geographic data base:

Data in GIS

Geographic data base:

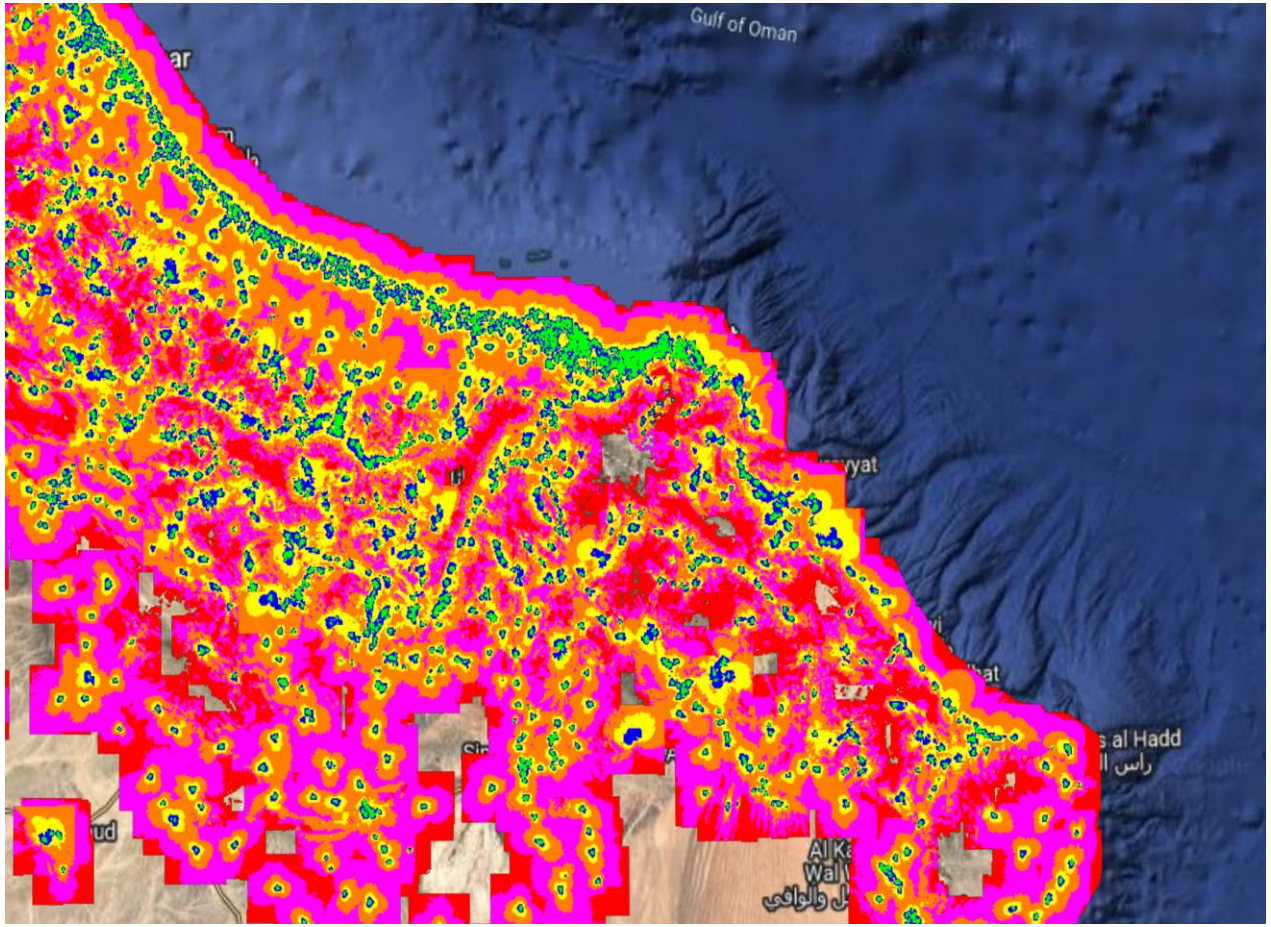


Coverage using GIS

The coverage layer is obtained by the operators.

Identifies the gaps and areas with lack of signal.

Companies’ advice to focus investments on areas lacking coverage.



Infrastructure management

Lands

Towers

Cables

- **<u>TRA Oman regulate:</u>**
    - **All lands designated for telecommunications purposes are owned by the Authority.**
    - **Lease Agreements.**
- **<u>To achieve:</u>**
    - **Preventing double investments.**
    - **Promoting Asset Participation between operators.**

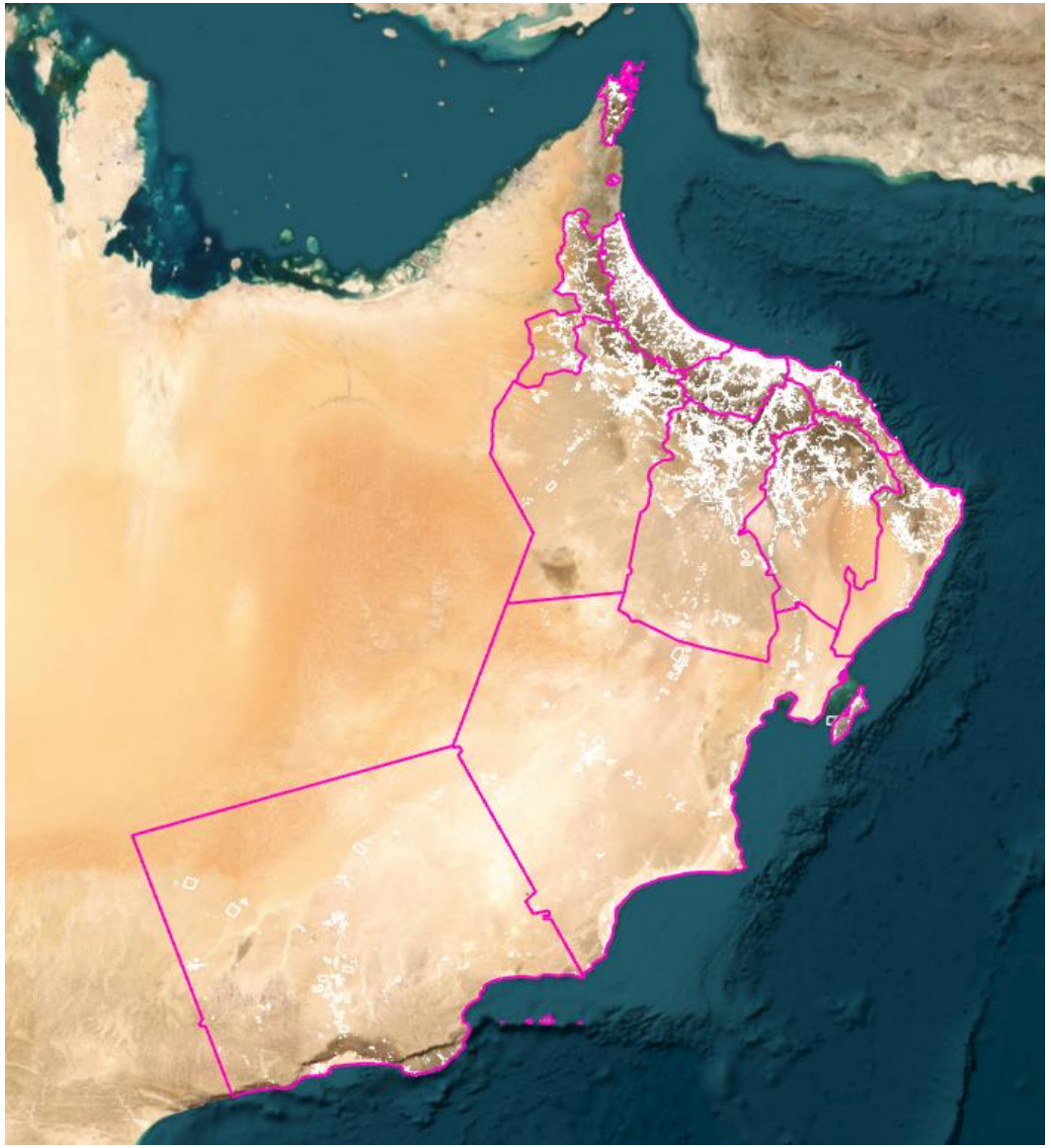
Infrastructure management

Lease agreement geographic data base:

Emergencies

- Real time maps to define outrages.
- Define disconnection in cables by coordination.
- Ensure service continuity.

Categorization of Localities based on economic potential

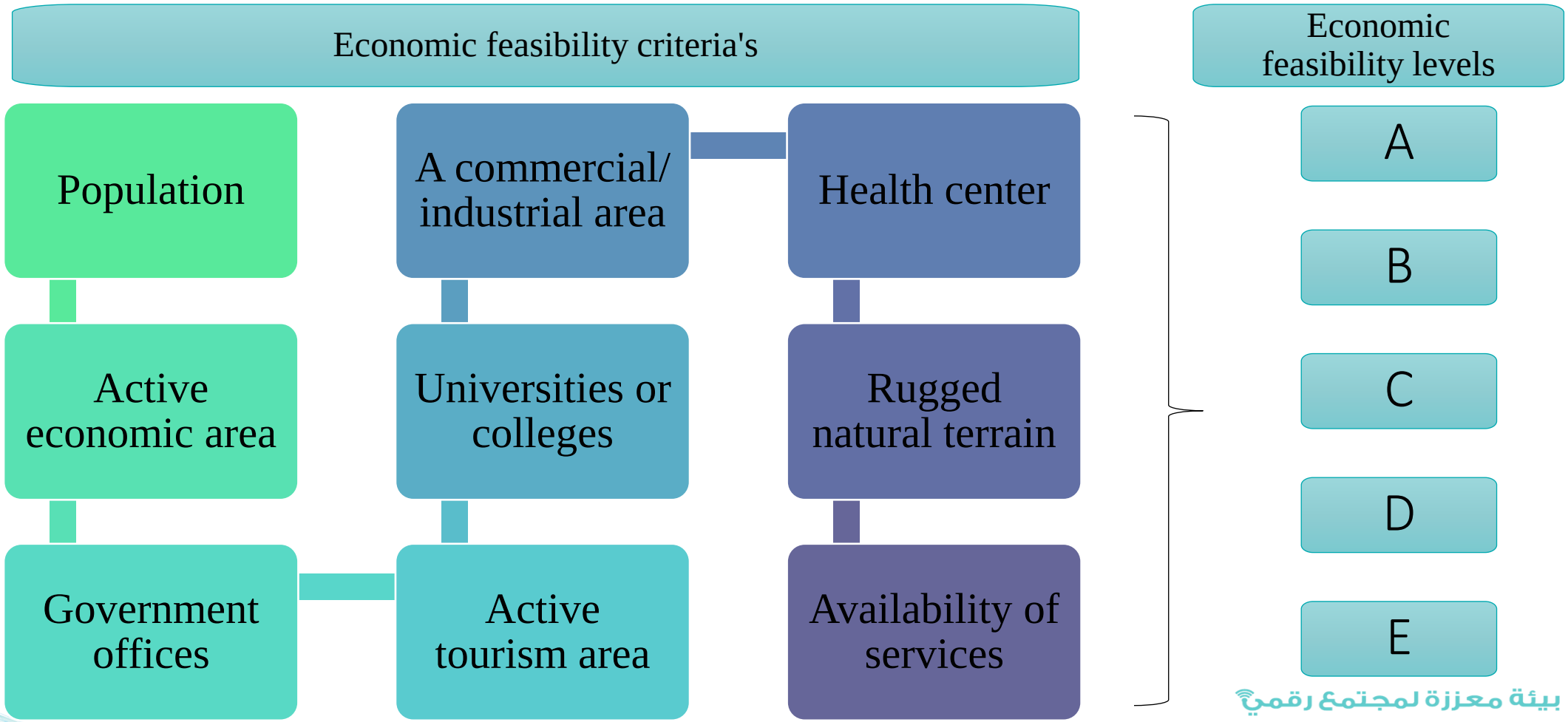


- **Scattered population and Rugged terrain.**

- **The population density of the Sultanate of Oman is approximately 17 people per square km.**

Categorization of Localities based on economic potential

The classification of Localities and assessment of the economic viability of regions contribute to optimal strategic planning for expanding coverage and identifying future projects.

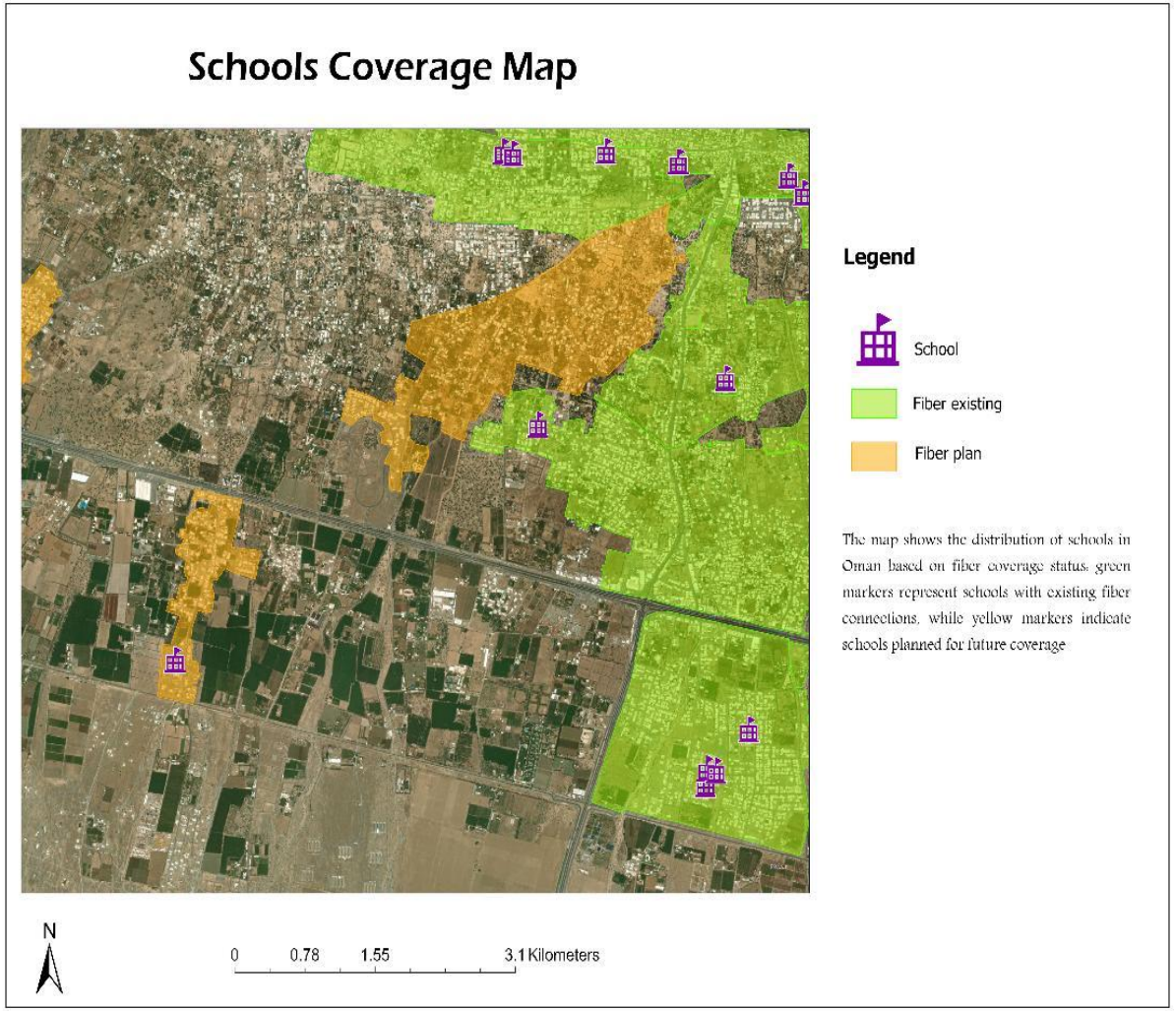


Projects: Internet access in school

100% Percentage of school have access to internet

97% Percentage of school with coverage of fixed broadband services.

54% Percentage of school with coverage by fiber.



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Data Validation Tools for Ensuring Accuracy and Integrity

Telecom indicators system

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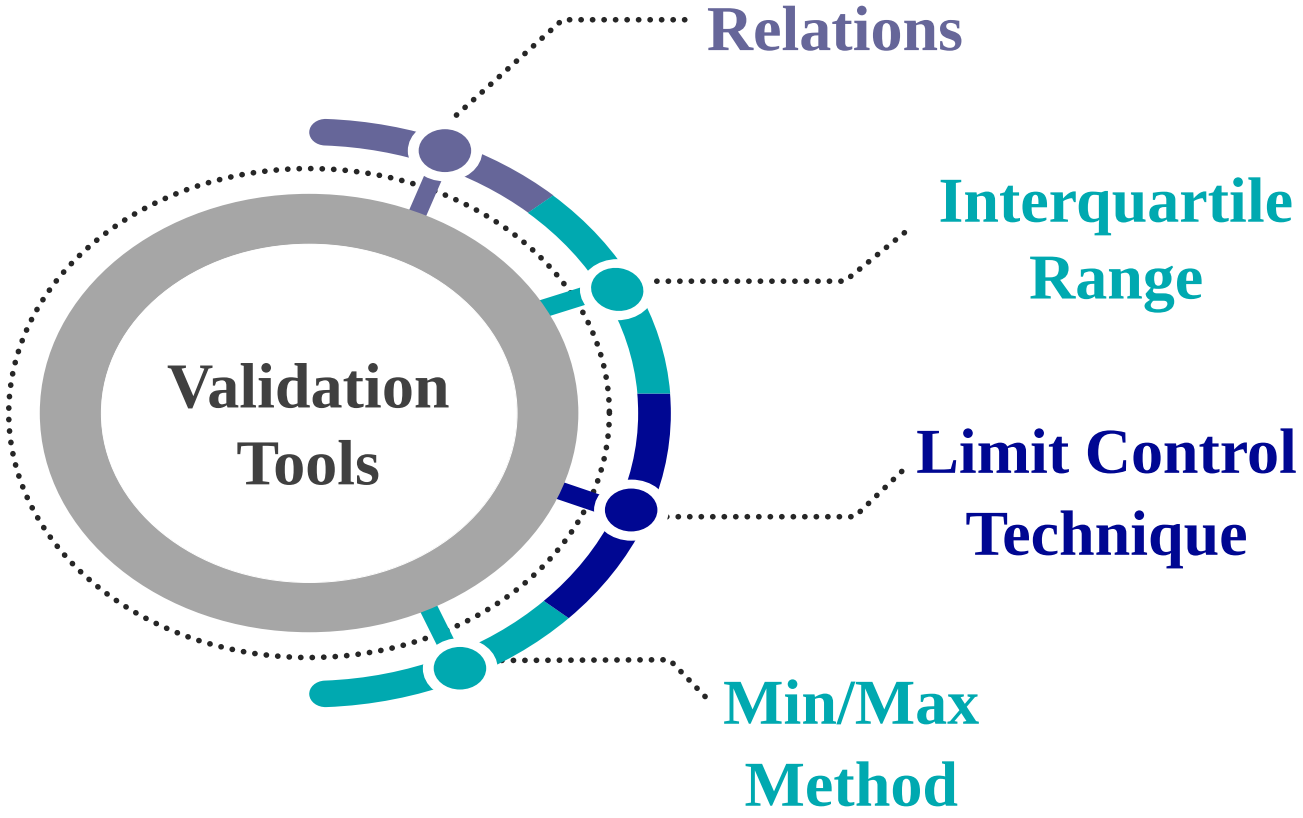
Introduction:

Telecom Indicators system: digital platform designed to collect, validate and analysis telecom data.
The system ensures standardized and timely data submission.
The system includes validation tools by applying statistical measures and techniques that showing and capturing the outliers & inconsistency in the submitted data points.



Validation Tools: 1. Relations

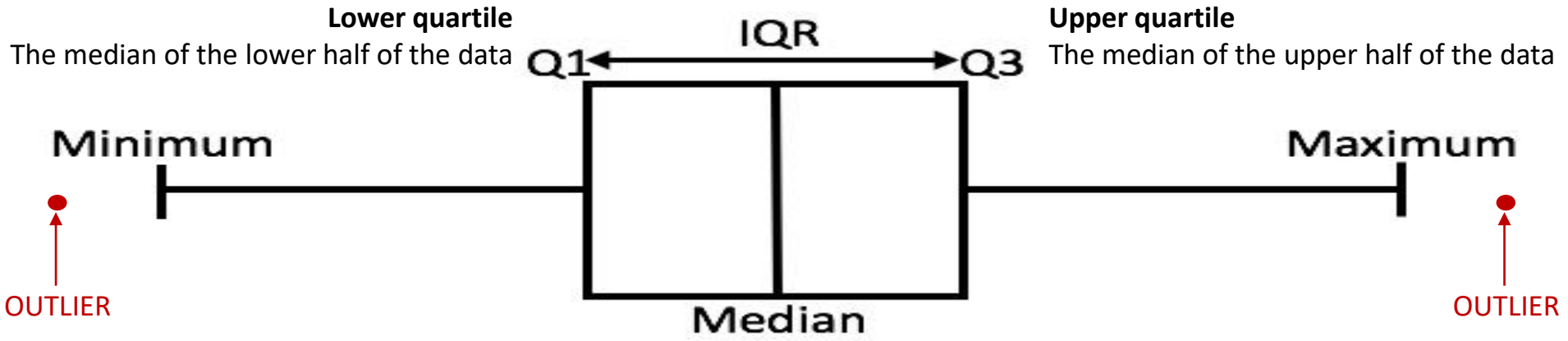
Based on **the ITU Handbook of Telecommunication Indicators**, which outlines the relationships between various indicators, this tool is designed to ensure the consistency and logical sequencing of those indicators. It helps verify that indicators with different breakdowns still reconcile correctly when they are supposed to be equal, and also checks that component indicators properly sum into their parent indicators.

	Relation (1)	Relation (2)	Relation (3)	Relation (4)
Fixed Broadband Internet Subscriptions	wired Broadband Internet Subscriptions + Wireless Broadband Internet Subscriptions	Fixed Broadband Internet Subscriptions by Govenorates	Fixed Broadband Internet Subscriptions; Business & Residential	Fixed Broadband Internet Subscriptions by speed
Fixed (wired) Broadband Internet Subscriptions	Cable Modem Internet Subscriptions + ADSL + FTTH + Internet Leased Lines			

Validation Tools: 2. Interquartile Range (IQR)

A measure of statistical dispersion, or how spread out the values in a data set are. It specifically looks at the middle 50% of the data. The IQR is a robust measure, meaning it's less affected by outliers compared to other measures like the range.
IQR= Q3 - Q1

- Minimum: Q1 − 1.5×IQR
- Maximum: Q3 + 1.5×IQR

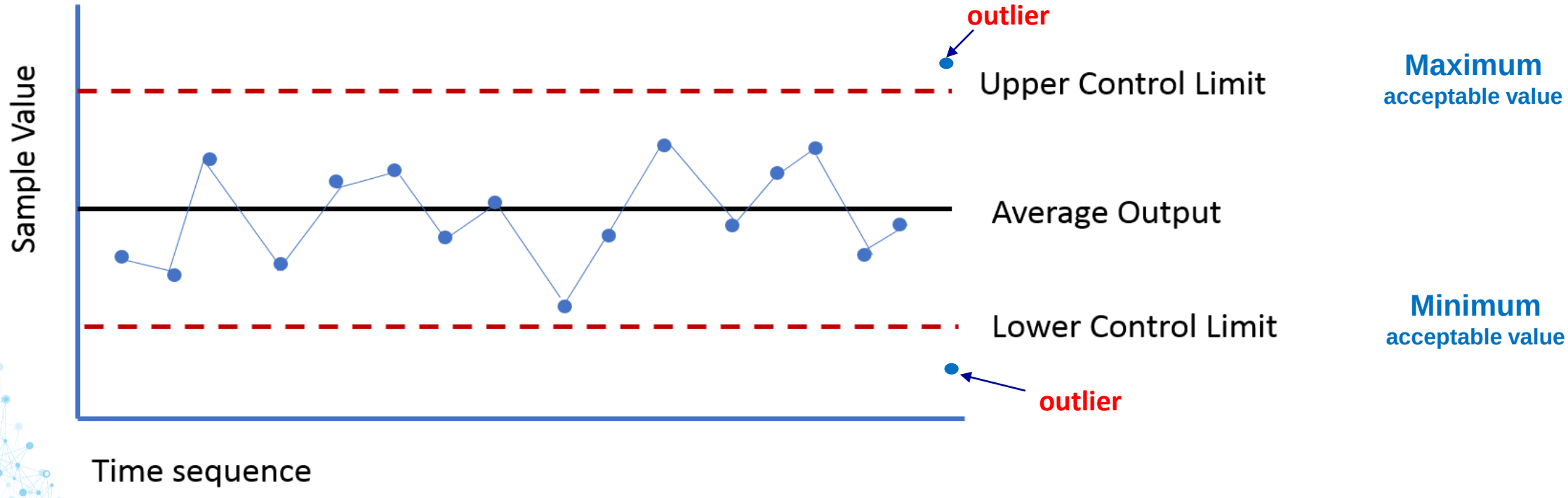


IF CURRENT OBSERVATION IS MORE THAN MAXIMUM OR LESS THAN MINMUM, then consider current observation an **OUTLAIR**

Validation Tools: 3. Limit Control Technique

A statistical tool used in quality control to monitor Data and distinguish between normal, random variation (common cause variation) and unusual, non-random variation (special cause variation) & define the expected range of variation by calculating:

Upper Control Limit (UCL): Moving Mean + (1.7 * Moving Standard Deviation).
Lower Control Limit (LCL): Moving Mean + (1.7 * Moving Standard Deviation).



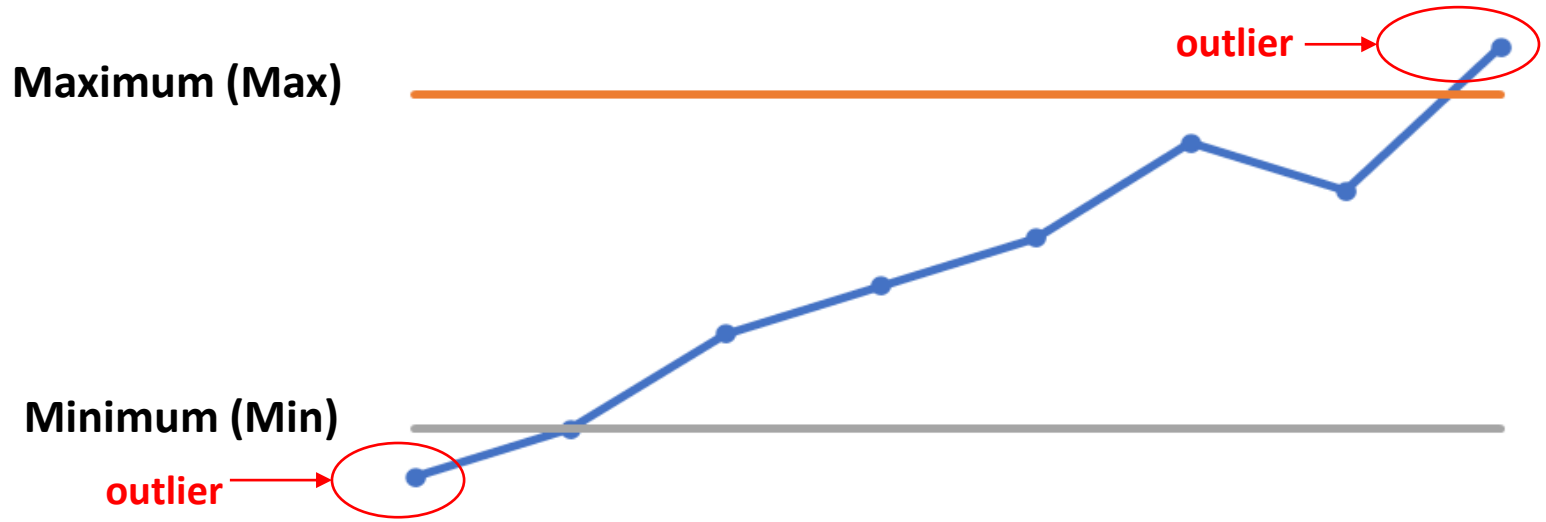
Validation Tools: 4. Min/Max Method

Simple analytical technique used to measure the greatest increase and greatest decrease in a dataset by calculating the percentage change between consecutive data points and identifying the maximum and minimum of those changes

Identifying outlier by calculating:

Upper case = Max Percentage of change + Moving Standard Deviation

Lower case = Min Percentage of change - Moving Standard Deviation



Thank you

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