

Revolutionizing Road Infra with Modern Equipment, Technologies, Sustainable Materials and Policy Guidelines

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International Road Federation
India Chapter

Tools and Techniques for Understanding Bituminous Mixes and Pavement Performance



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Asset Acquisition: Cycle of Thought Process

BEFORE

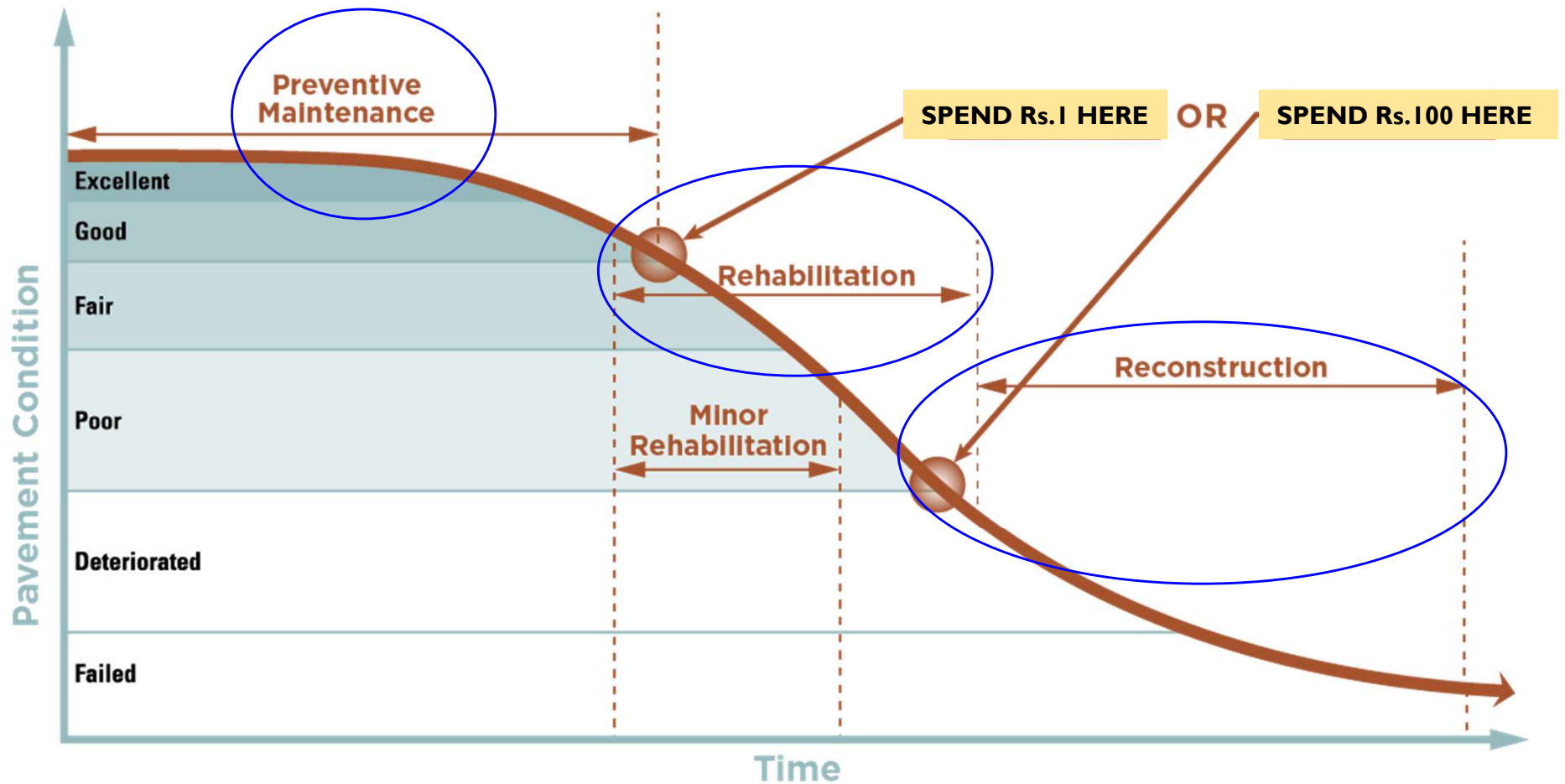
- Assessment, Evaluation, and Due Diligence
- Condition of pavement, and expenditure

AFTER

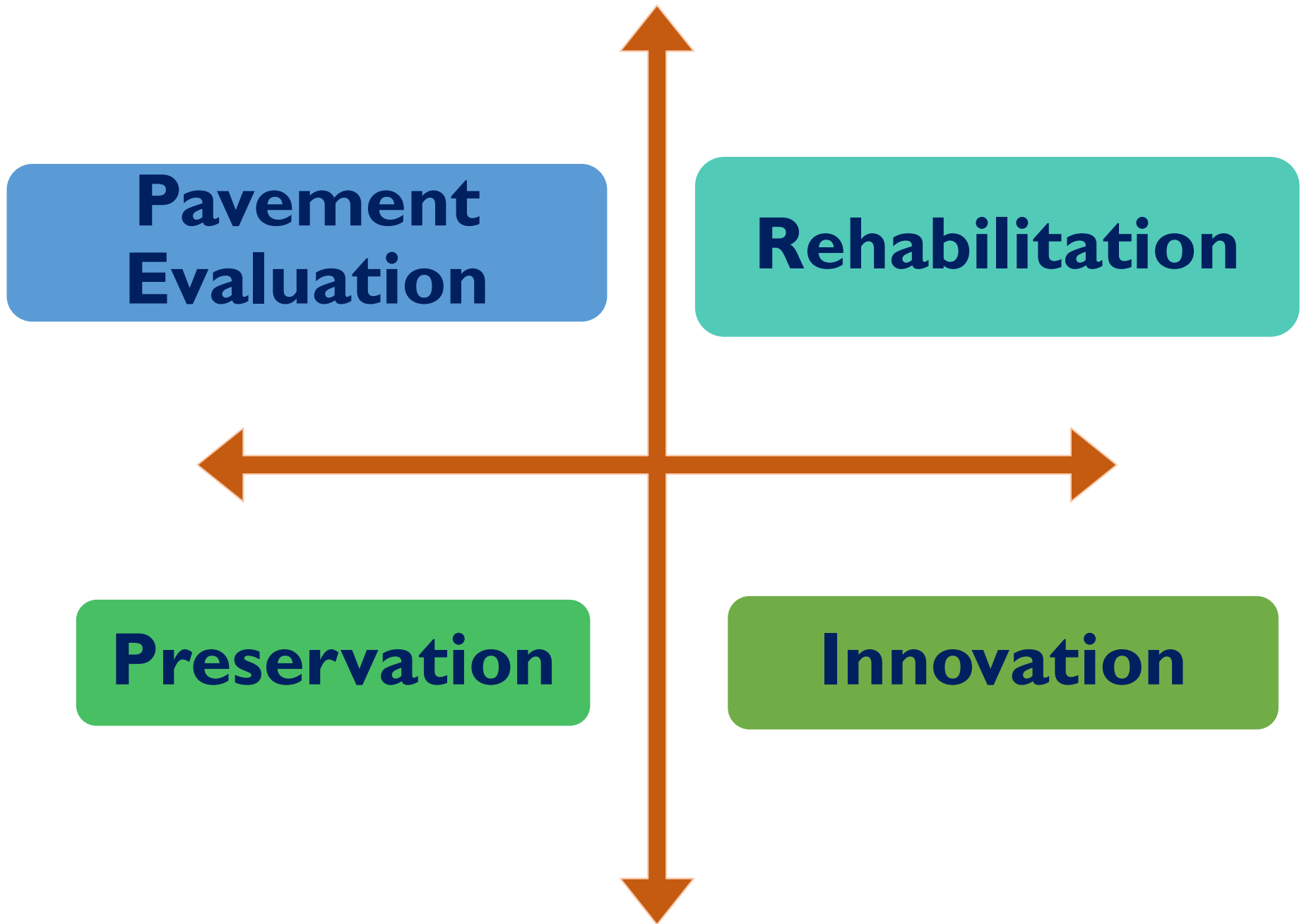
- Repair, preservation and maintenance
- New technology and techniques to extend life
- Valuation for O&M



Pavement Life-Line Situation



Maintenance, Rehabilitation and Reconstruction



There is scope of technology implementation in all spheres

Techniques and Technologies

1. **Milling and Recycling**
2. **Additives as Performance Enhancer**
3. **Preservation**
4. **Structural Analysis: Remaining Life**
5. **Best Paving Practices**
6. **Training and Tools: Equipped Workforce**
7. **New Mixes and Methods**
8. **Data Collection and Management**

Practice/Process which can help to minimize life cycle cost and bring long lasting, durable, and sustainable highways.

Assessment of Pavement Condition: Deal on Table



- New construction/old construction
- Is condition of pavement good?
- What is life of pavement?
- What would be expenditure cycle?
- Equation on cost and benefits

Understanding health of pavement is one of the important factors for wise investment.

Structural Condition of Pavement: Falling Weight Deflectometer (FWD)

Remaining life of pavement/structural condition of pavement.

You can be fooled with this tool (outcome can be proportional to expenditure/cost)



Reliability and Confidence on data and outcome.

Functional Condition of Pavement: Network Survey Vehicle (NSV)

Ridding quality and distresses on a pavement.

There is no logical presentation of the data, except dumping data on agency, and making scretch their head.

Effective use of data and utilization of outcome in pavement management.



Reliability and Confidence on data and outcome.

Data Collection and Management

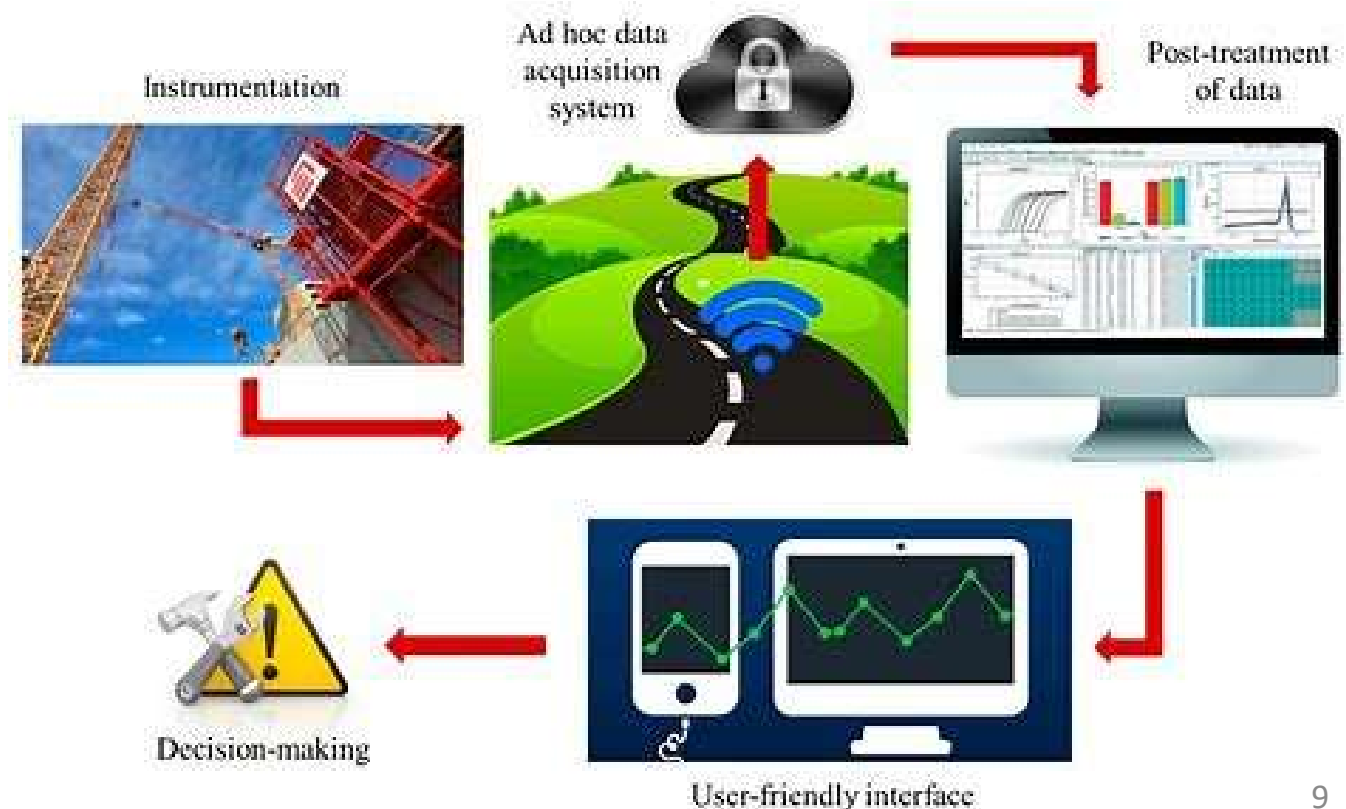
1. NSV

2. Regular distress survey

Integration is key

3. Pavement tools

4. FWD



Milling and Recycling

- Require on many projects
- Availability of RAP materials
- Considering for maintenance rehabilitation



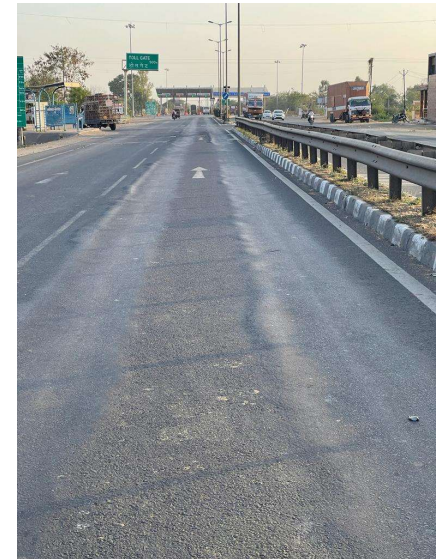
Use of milled RAP can help to optimize cost and bring better life.

Build Asset



Additives as Performance Enhancers

- Polymer modified bitumen
- Hybrid CRMB
- Hybrid PMB
- Waste Plastic
- Innovative Products



**Purpose: Good performance, optimize cost, reduce maintenance expenditure.
Confidence building and field performance**

Unmodified bitumen sometimes not suitable for heavy traffic, and high temperature locations.

Bitumen Grade System

ISI5462:2019 – PG Grade
for PMB bitumen

Penetration

60/70

PMB40

Softening

CRMB55

PG: Performance Grade (PG 76-22)

- The bitumen can sustain maximum pavement temperature up to 76 C
- Low temperature up to -22

Viscosity Grade

VG40

Superpave

PG76-22

Superpave Plus

PG76-22E

Better tool to receive quality product

Pavement Preservation: Minimize O&M Cost

- Implement technology for preservation of pavement
- Minimize expenditure
- Enhance life
- Few Technology
 - Micro-surfacing
 - Thin Overlay
 - Innovative Solutions
 - Combination of recycling



Best Paving Practices

- **Mix design**
- **Plant operation**
- **Paving, rolling**
- **Continuous material supply**
- **Plant capacity**
- **Demand and supply**



**Good materials with poor paving practices
can lead to serious consequences**

Training and Tools

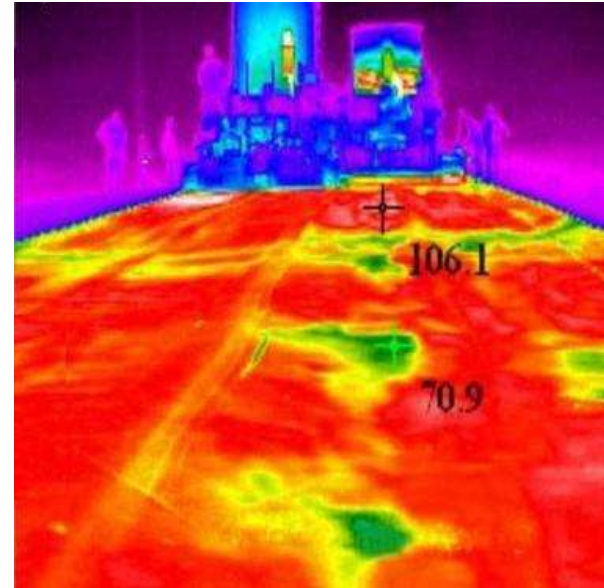
- Milling and Recycling
- Additives
- Preservation
- Structural analysis
- Best Practices
- Training and Tools



With change in traffic, materials, technology, and increase in cost of O&M, it is imperative that agencies embrace training and tools to upgrade themselves.

New Mixes and Methods

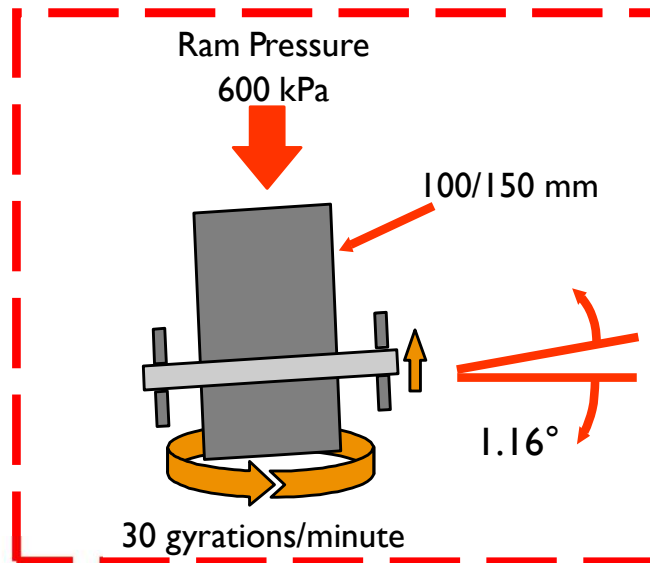
- Infrared Thermal Camera
- Intelligent Compaction
- Thin Overlays
- Inline paving (both DBM-BC together)
- Stone Matrix Asphalt
- Superpave mix design
- Performance of Mixes



Practice/Process which can help to minimize construction cost and minimize life cycle cost.

Superpave Mix Design

20 Year Design ESALs (in millions)	Compaction Parameters		
	N _{initial}	N _{design}	N _{maximum}
< 0.3	6	50	75
0.3 to < 3	7	75	115
3 to < 30	8	100	160
≥ 30	9	125	205



Gyratory Compactor



- Mix Preparation: 5, 5.5, 6, 6.5, and 7% (with 0.5% Jump)
 - Binder Content along 4% Air Void → OBC
- At OBC
- We check Volumetric Parameters (i.e. VMA, VFA)
 - Moisture Damage → Tensile Strength Ratio (TSR)

Does it simulate the field compaction practice ?



Does it consider mix performance ?



Time to upgrade mix design considering traffic/climatic conditions.

Hamburg Wheel Tracking Test (HWTT)



All bituminous mixes may not be suitable

**Understanding
Technology**

Technical Support

+

Training

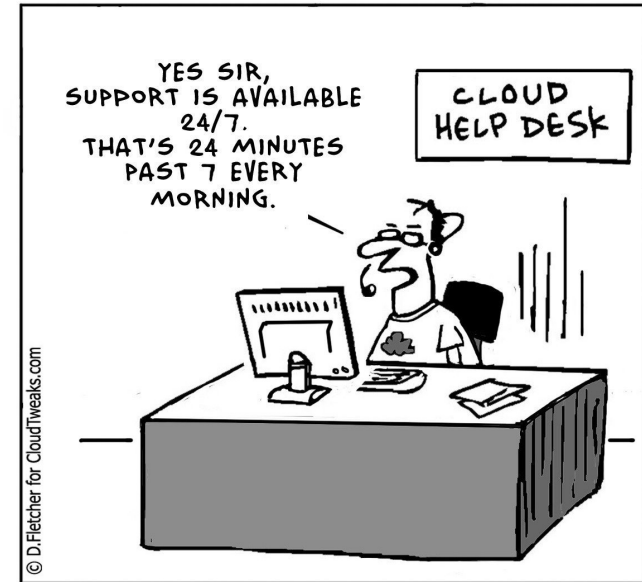
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**Quality Control
Mechanism**

+

Acceptable Policy

Data and Performance Feedback



**Successful
Technology
Implementation**

Caution:

**Technology is not a substitute of poor paving
practices and lack of quality control**

THANKS



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