Transportation Business Unit

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Enhancing the Scalability of iRAP Road Safety Assessments in Low- and Middle-Income Countries

Evidence from an AI-Supported Pilot Study in Kenya

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Meet The Authors

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Background

The Challenge

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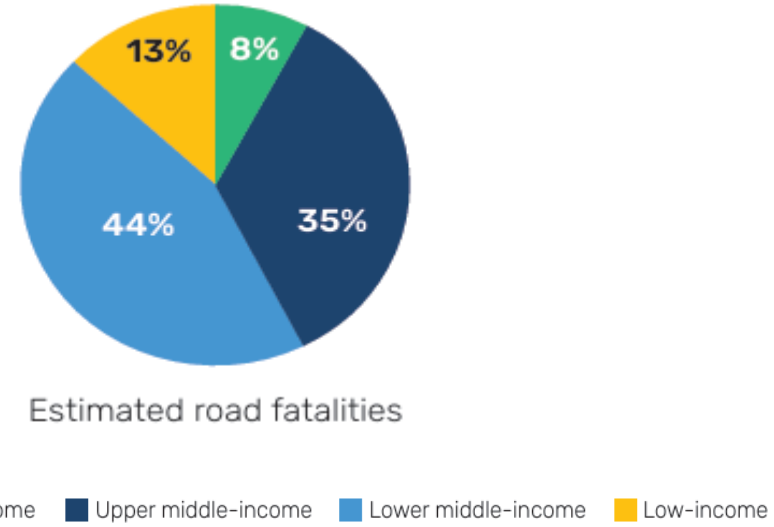
- ✓ Road traffic injuries are a leading cause of death (5–29)years and 12th across all age groups globally. LMICS-57% (WHO, 2023)
- ✓ iRAP provides a globally recognised framework for assessing the safety of road infrastructure through Star Ratings and fatal and serious injury (FSI) estimates Which rely heavily on manual coding of road attributes .



Background

MANUAL IRAP LIMITS

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- ✓ Traditional iRAP coding is labor-intensive and slow, with coder fatigue limiting productivity and accuracy, thereby delaying vital safety countermeasure determination for extensive road networks (More Time is spent on Manual Coding).

THE OPPORTUNITY

- ✓ Computer Vision (360◦ Video, Updated Open data sources eg Mapillary etc) and AI offer a path to improve efficiency, consistency/Accuracy, and scalability in road Safety assessments Using IRAP Methodology.(Road Attribute Coding).

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Source IRAP

Coder nam	Coding dat	Road surve	Image refe	Road name	Section	Distance	Length	Latitude	Longitude	Landmark	Comment	Carriagew	Upgrade co	Motorcycle	Bicycle obs	Pedestrian	Pedestrian	Pedestrian	Land use -	Land use -	Area type	Speed limi	Motorcycle	Truck spee	Differentia	Median typ	Centreline	Roadside s	Roadside s	Roadside s	Roadside s	Shoulder r	Paved shoi	Paved shoi	Intersectio	Intersectio	Interse
oketchcliff	########	########	Kadzengo-	A7_Kadzer	Kadzengo -	0	0.1	-3.89452	39.7735			3	3	1	1	1	6	2	4	1	2	5	5	5	1	11	1	2	13	2	8	1	4	4	12	1	
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Upload File Sample :Source KeNHA

Study Aim and Pilot Context

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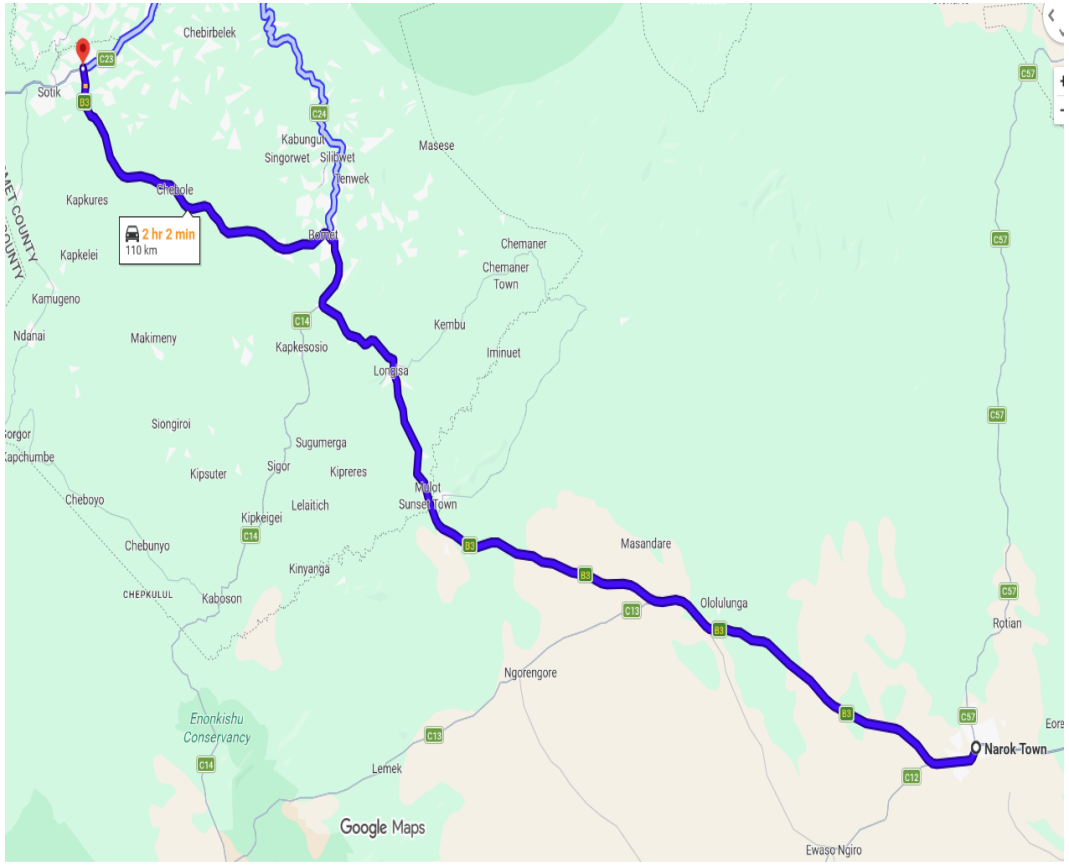
Objective

- ✓ Evaluate the effectiveness of AI-supported road attribute extraction compared to manual coding in terms of:
    1. Productivity and Efficiency (Time Savings)
    2. Consistency and Accuracy (% ge Error)
    3. Scalability for Kenya's National Network(Kms Covered)

Pilot Scope: Approx .138 km covered .only the B7 road section, representing about 104 km, was directly compared with the manually coded section from the KeNHA 2024 project.



Key Metrics: Time savings, Kms Covered, 20+ accredited attribute % ge error rates.

Methodology: Manual Coding & AssetMAPPER Roads

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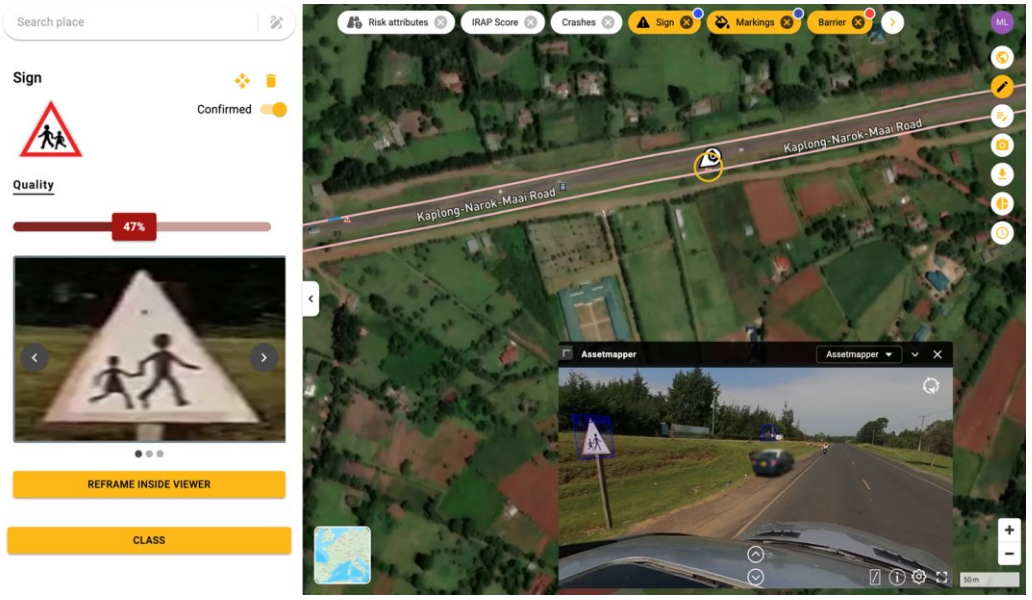


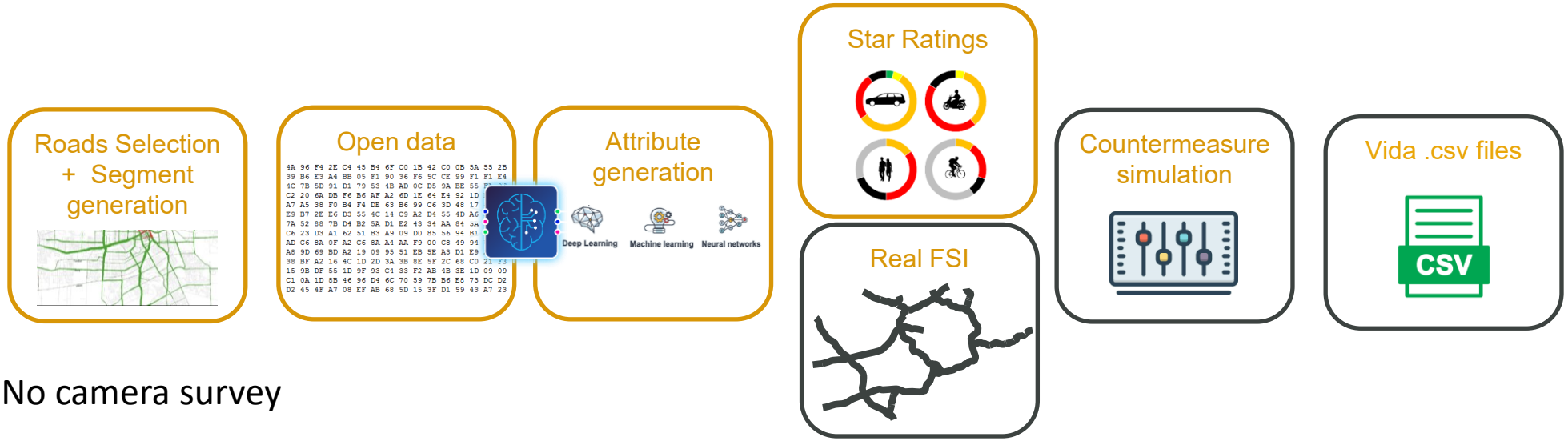
Two-Step Approach

1. Conventional iRAP workflow, in which trained coders manually reviewed video imagery, extract road attributes, populated spreadsheets/Demonstrator per 100m sections, and Process the upload files on the ViDA platform.

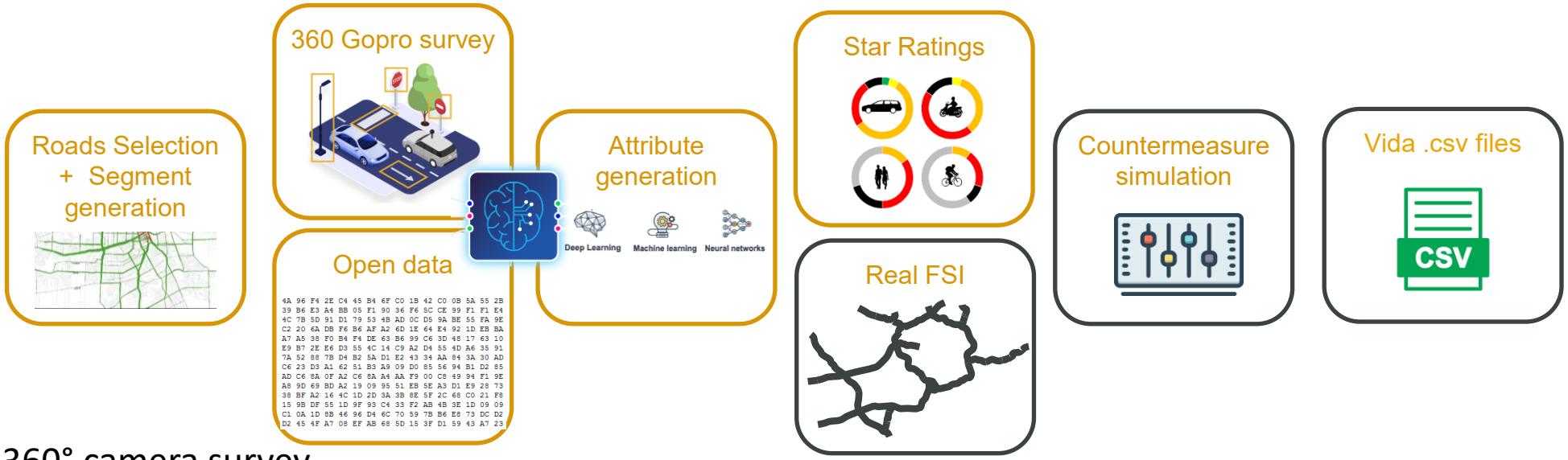
2. Automation: AssetMAPPER integrates computer vision(360◦ Video, Open data sources eg Mapillary etc) to automatically detect Road attributes from geo-referenced imagery and Simplified manual validation for remaining subjective attributes and Default Values .

$$\text{Percentage Error} = \frac{\text{False (non-matching) Values}}{\text{Total Sample Points}} \times 100$$

iRAP coding with AssetMAPPER Detailled process



No camera survey



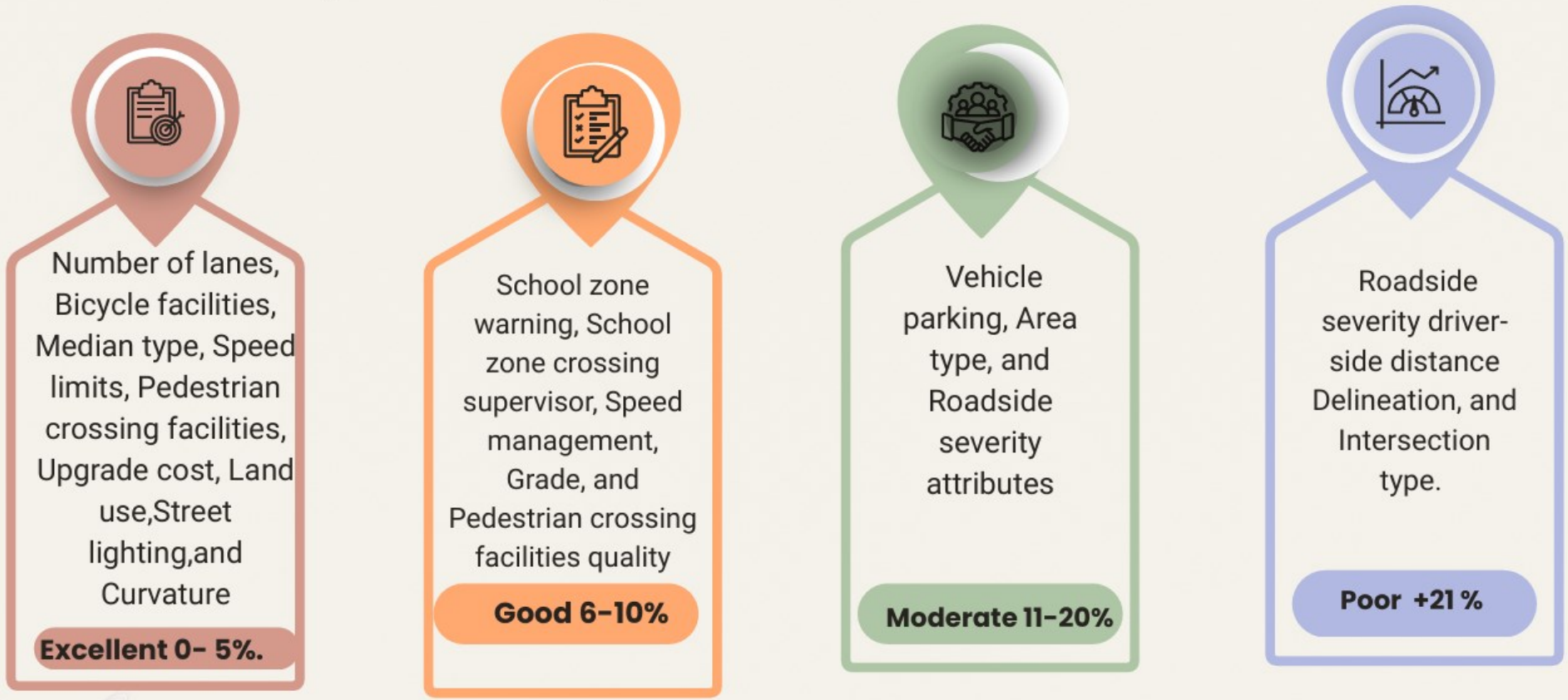
360° camera survey

AI Performance: Agreement Levels/%ge Error

Average Error Rate for 20 + Road attributes : approximately 8%.

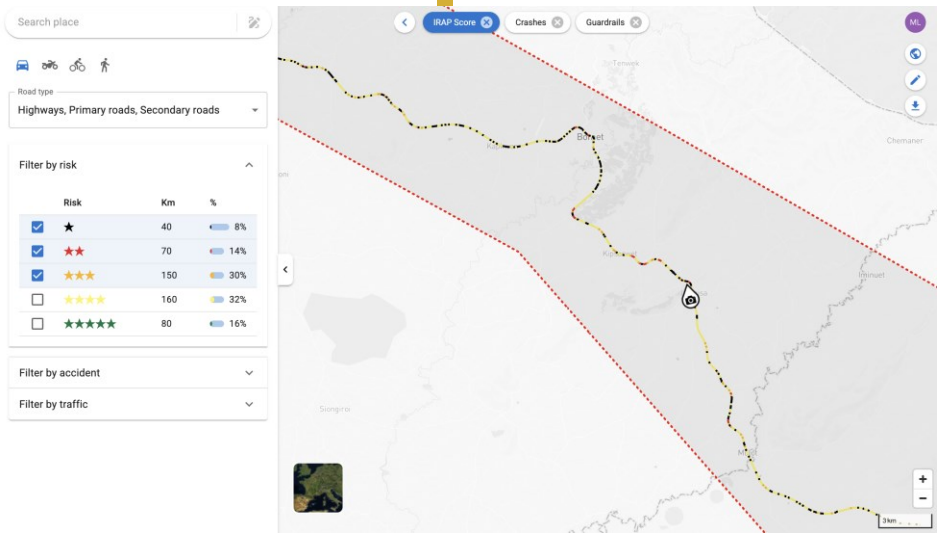
✓ AI performance varied across the coded attributes, with percentage errors ranging from 0% to 27%.

Excellent : Clearly defined and easily visible attributes



✓ *Some Attributes were not comparable as they are affected by the time and day of survey e.g. Flows ,Signs ,Parking etc*

Results



- ✓ **Conventional:** 676 km took 4 coders ~10 weeks (17 km/week per coder) 67.6 km per week (team output). KeNHA 2024
- ✓ Six Coders -3000 km in 4 weeks.125km per Coder in 1 week. Well Trained.(IRAP)
- ✓ **AI-Supported:** Demonstrated potential to code **1,000-1200 km in 5 Days. (From Past Projects in France & Italy)**

- ✓ Approx 75% Reduction in Coding Time
- ✓ Automation of 20 key iRAP accredited attributes + 15 in Dev+ Default Values reduced repetitive manual tasks and lowered coder fatigue.
- ✓ Improved consistency. AI -High (standardized) & Manual-Varies as its Coder dependent.
- ✓ Average Error Rate for 20+ Road Attributes: approximately 8%.
- ✓ Enabled network assessments (14-15) times with existing human resources.
- ✓ Integration with crash data enabled faster identification of high-risk sections (Geo-Ref data Not available in LMICs)

Conclusion

- ✓ AssetMAPPER reduces coding time by 75%.
- ✓ Automation improved productivity, consistency, and coder efficiency, with an average percentage error of approximately 8%.
- ✓ Scientific and calculation-based attributes showed the highest accuracy, while dynamic attributes recorded higher variation.

- ✓ Human Expertise remains vital for validating low star ratings sections and defining Best ROI countermeasures.
- ✓ Country-specific default values and configurable settings further improve detection accuracy and reduce error rates.

- ✓ Integration of automated road attributes with crash data enables faster identification of high-risk sections.
- ✓ In a project conducted in Italy, AssetMAPPER achieved approximately 85% accuracy in a similar comparison against manual coding.

Conclusion

NOTE-AI achieved approximately the same level of accuracy comparable to manual coding for the 20+ Accredited attributes and has the potential to surpass it with further training ,More Attributes accreditation and refinement of default values configuration. However, human expertise remains essential for selecting appropriate countermeasures particularly where contextual interpretation and engineering expertise are required, making a combined AI–human approach the most effective solution.

Conclusion : Roadmap

PILOT-Q4 2025

20 Accredited Attributes
Kenya Network -Success

DEVELOPMENT-Q 1&2 2026

25 Additional Risk
Attributes Submitted to iRAP for
Accreditation

TARGET-Q3 2026

Target: 40+ Accredited
AiRAP Risk Attributes

Overall, the pilot indicates that AI-enhanced iRAP workflows provide a practical and scalable solution for accelerating proactive road safety assessments.

About Us

TRANSOFT SOLUTIONS

Transoft Solutions develops and supports innovative and timesaving software and services to help professionals plan, design, and operate safe transportation systems.

30+ YEARS

of innovation

150 COUNTRIES

with over 50,000 users

15 OFFICES

to serve you globally

TRANSOFT SOLUTIONS

Thank you!

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