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Drivers' Information and Practical Training Assessment Results Management System: A Recommendation for NIT

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Abstract*: Road Traffic Injuries (RTIs) resulted from Road Traffic Accidents (RTAs) have high contribution to human deaths globally where in 2023, 1733 RTAs which resulted into 1647 deaths were recorded in Tanzania with human factor contributing 97% of the RTAs. The situation has raised a need to conduct a study to identify how drivers training processes are handled in Tanzania. The National Institute of Transport (NIT) was selected for the study to present the current situation since it is the institute offering training to the professional drivers and drivers' instructors in Tanzania. In-car, Automated, Simulator-based, Structured Off-Road and Clinical Drivers' Assessments were identified in the literature as the common methods for assessing the drivers' practical skills. Interview was used to collect data from the targeted personnel who were identified as Director of Academics Support Services (DASS), Head of Department (HoD) for driving courses and National Institute of Transport Certified Driver Instructors (NIT-CDIs). The research findings highlighted issues in the process of drivers' registration, record keeping and backup, assessment methods, result verification, analysis and reporting. The study has recommended algorithms in some crucial aspects of the drivers' trainings that could be used to improve the standard of the drivers' training processes which could ultimately contribute to the reduction of RTAs and RTIs in Tanzania and globally. Further researches are needed to study the driver training processes in other institutes in Tanzania and recommend better, affordable and more effective approaches for handling drivers' trainings.*

Keywords: *Certified Driver Instructor (CDI), Road Traffic Injuries (RTI), Road Traffic Environment (RTE), Driver Assessment, Information and Communication Technology (ICT), Information System (IS)*

1. INTRODUCTION

Road Traffic Injuries (RTIs) resulting from Road Traffic Accidents (RTAs) have been identified as one among the factors that has a great contribution to the loss of human lives holding 8th position surpassing diseases like HIV/AIDS, tuberculosis and diarrhoea and a leading factor to the deaths of children and young adults between 5 and 29 years [1]. For instance, in Europe, RTAs have contributed to the deaths of 20,400 people in the year 2023 which is 1% decrease when compared to the year 2022 [2]. These accidents have been identified to be caused by different factors where European Commission [2] has identified Vehicle, Infrastructure and Human as the main factors contributing to the RTAs. That being the case, different countries across the globe have applied some efforts to reduce the RTAs by working on the factors based on the financial capacity, experience and priority of the country in order to alleviate the problem.

In case of the motor vehicle factor, the current industry has globally introduced vehicle designs equipped with different technologies which reduces the chances for drivers to make mistakes and cause accidents while driving as well as protecting the vehicle from faults which could also result into RTAs. These technologies include Electronic Stability Control, Anti-lock Braking System (ABS) and other warning alarms and lights appearing on vehicle's dashboards to alert drivers on various issues that could lead to potential RTAs and RTIs. Also, the New Car Assessment Program (NCAP) plays a huge role in providing standards for improving cars' safety which in turn reduces the RTIs by protecting passengers and pedestrians [1,3,4].

In case of the infrastructure factor, some developed countries have improved the road infrastructure to be safe and suitable for all road users where Shakti [5], identified that in countries like United States, Canada and some European countries, the pedestrian signals, infrastructure and crosswalks are designed to give priority to pedestrians. According to WHO [1], 112 countries have established national design standards for speed management, 92 countries have standards aimed at separating pedestrians and cyclists from motor vehicle traffic, and 132 countries have design standards for providing safe crossings for pedestrians and cyclists.

In case of human factor, it has globally been identified that there is a need to train and provide awareness to all road users on the proper road usage in order to reduce the chances for RTAs and RTIs. This is justifiable due to the fact that human factor contributes 70% to 80% of the RTAs according to Gebru [6], while Glassman Injury Lawyers [7] also insisted that human is the source of RTAs. In case of pedestrians, in countries like France, Cameroon and India, the education on safer road behaviours has been piloted to children and young adults aged 10 to 18 in 2019 through Vision, Information and Action (VIA) programs [8] in order to reduce RTIs. In most of the European countries education on road safety is provided at primary schools [9]. In Iran, there has been a recognized need to train pedestrians on road traffic safety [10]. On the drivers' side, powered-vehicle drivers are required to have knowledge and skills needed to drive the given vehicle [11]. The knowledge and skills required are necessary to reduce the RTAs and RTIs where most of the countries have been able to comply with the requirement by demanding drivers to attend training and being tested before being licenced to drive a given vehicle category. Despite the fact that most of the countries require powered-vehicle drivers to attend training before being tested by the regulatory authority for driving licence acquisition, still the management of drivers' training differs from one training institute to another. For instance, in Sweden, the assessment of drivers is carried out by many occupational therapists and their assessment process vary, implying a lack of standardized structure for drivers' assessment [12].

In the Tanzanian context, RTAs and RTIs remain alarmingly high. In 2023, the number of recorded RTAs increased from 1720 in the year 2022 to 1733, resulting in 1647 deaths and 2,716 RTIs, with human error reported to have contributed 97% of these RTAs [13]. The United Republic of Tanzania Road Traffic Act [14] requires drivers to attend training at a recognized Institute having Certified Driver Instructors (CDIs) before taking a driving test which will award a certificate of competence to a driver after achieving the required test scores. The management of the drivers' trainings and records is also under the control of the institute offering the training hence raising the need for study to be conducted on how these institutes manage their trainings and recommend better practices that would improve the driver trainings and reduce the RTAs and RTIs in Tanzania.

Hence, the purpose of this study is to highlight handling of drivers' training in the Tanzanian context. Specifically, the study aims to analyse how drivers are registered and the methods used to assess their practical skills. Furthermore, the study aims at identifying how the drivers' assessment records are managed at the training institute level. The National Institute of Transport (NIT) has been chosen for the study since it is a public higher learning institute providing a wide range of trainings in Logistics, Management and Transport Technologies including training for the Professional Drivers and the Drivers' Instructors (also known as Training of Trainers) in Tanzania. This research will identify the current practice in handling the drivers' trainings and propose important system algorithms that can be implemented to improve the assessment standards leading into more qualified drivers and, in turn, contributing to the reduction of RTAs and RTIs in the country and globally.

This research paper has been organised in sections which are Introduction, Literature Review, Methodology, Results, Discussions, Conclusion and Proposed System Algorithms.

2. LITERATURE REVIEW

The literature review for this research paper provides a highlight on the methods used for assessing the drivers' practical skills, whereby the commonly used methods for assessing the drivers' practical skills are identified and presented in this section. The most common method for assessing the drivers' practical aspects is referred as In-car Drivers' Assessment where the drivers are assessed by CDI who sits in the testing vehicle along with driver to be assessed. The CDI observes and note down all the activities performed by the driver under assessment as he drives the vehicle in the given Road Traffic Environment (RTE). According to Vaughan Driver Training [15], the in-car assessment includes vehicle inspection, backing skills and handling of the vehicle in different RTEs based on Canada Safety Council Defensive Driving criteria. This approach is also commonly used for assessing newly hired drivers and existing employees [15,16]. Though this method is very easy to follow and highly accepted, but it still introduces some issues in the assessment since the assessment is based on the instructor observation hence susceptible to observers' bias [17]. Not only that but it is commonly true that people perform better when they recognized that they are under observation [17]. This may result into failure to get the actual performance of a driver when driving without being observed.

Contrary to the In-car Drivers' Assessment method, countries like Korea, China, Botswana and Rwanda currently use Automated Drivers' Assessment method to assess the drivers. Special training vehicles installed with systems for assessing driver's behaviour are being used to assess the driving skills of the drivers automatically. The assessment involves yard test which is 100% automated and road tests where during assessment the system integrated in the vehicle automatically rates driver performance and record the assessment progress automatically [18]. This system has some advantages since the rating records of drivers are recorded and saved automatically. Not only that but also the increased transparency of the process is another advantage which also result into reduced appeals of the drivers' results [18]. Furthermore, the systems are designed to reduce operational costs, enhance accuracy, and ensure fairness in assessing test results [19,20]. On the other hand, the system poses a common issue of high initial cost just like most of the ICT systems. The costs are mainly in terms of time, resource and expertise needed to deploy the system [21].

Furthermore, instead of taking the driver to the given RTE and exposing him, the vehicle and other road users to the road safety risks introduced by the driver under training, Simulator-based Drivers' Assessment method has also been introduced where the driver skills and performance are assessed using the special driving simulators which do not require

the driver and the vehicle to move on the physical road rather, they drive in the virtual roads. According to Campos et.al [22], simulators offer multidimensional challenges associated with complex tasks in more realistic ways. Furthermore, simulators offer more safety compared to on-road assessment where the assessment environment and scenarios can easily be modified and reproduced [22]. Not only that but also Casutt *et al.* [23] have identified that on-road performance and cognition in older adults can be improved by driving simulators. The driving simulators also offer more usefulness when it comes to the testing of new automated vehicles. According to Casutt *et al* [23], assessment of new automated vehicles decision-making models and planning in mixed traffics using driving simulators has been proved to be reasonable and effective approach. In addition to that, the use of simulators provides safety, repeatability, and cost effectiveness when compared to the real-world tests using real vehicle [24].

Leaving aside the common drivers' assessment methods whose main objective focuses on assessing the drivers' ability to drive a vehicle under normal road and traffic environment particularly in cities, there have been a Structured Off-Road Drivers' Assessment method which involves assessing the driver's ability to navigate obstacles, control the vehicle and pre-start checks. According to City & Guilds [25], ability to navigate obstacles is assessed by checking the ability of the driver to escape obstacles, dealing with slops, ditches, water crossing, operate a trailer and vehicle mounted winch where the trainings are conducted for candidates holding UK driving licence. This kind of assessment is also used in militaries to evaluate mobility under specific requirements of an off-road military ground vehicles [26].

Additionally, apart from the Structured Off-Road Drivers' Assessment which does not focus on the normal city' RTE, there is a Clinical Drivers' Assessment method which provides thorough clinical assessment for the individuals who may be at heightened risk of experiencing an automobile accident [27]. Visual screenings, standardized assessments of cognition and memory, range of motion, muscle strength and sensation, and visual perceptual skills may be involved in Clinical Driving Assessment [27]. Different researchers have explored driving safety and assessment tools for individuals with specific clinical conditions such as Parkinson's disease, dementia, traumatic brain injury and stroke [28-30].

3. METHODOLOGY

3.1 Research Approach

The research employed the qualitative method to gather data from the participants through focused interviews. This was done in order to intensively gather data from the targeted participants and obtain the individual experiences on the intended themes as well as maintaining consistency across different interviews under the same participants' category.

Since the study specifically aims at identifying the drivers' registration and practical assessment processes, members of NIT's Directorate of Academics Support Services (DASS), Head of Department (HoD) for drivers' courses and NIT's Certified Driver Instructors (NIT-CDIs) were identified as the appropriate categories of the participants to gather data for the study. The participants were separately consulted for the interview in order to ensure that each participant provides individual opinions which are free from others' influences.

3.2 Population and Instruments Used

The consulted participants for the study were the individuals who previously worked and currently working under the mentioned categories where the distribution of the participants and the percentages based on the targeted number are presented in Table 1. Separate interview guide for each participants' category was designed using the thematic framework where topic and or subtopics relevant to the study were formulated based on the research objectives and finally the appropriate questions relative to the topics and participants' category were structured. The presentation for topics, sub-topics and related questions for DASS, HoD and NIT-CDIs are separately presented in Table 2,3 and 4 respectively.

To gather information from participants, researchers mostly used audio recording tools to ensure each piece of data from the participant is comprehensively gathered by the team. Furthermore, note books were occasionally used for note taking based on the consent of the participants.

Table 1: Participants' categories and distributions

SN	Participants Categories	Potential Participants	Actual Participants	Percentage
1	DASS	2	2	100.0%
2	HoD	2	2	100.0%
3	NIT-CDI	5	3	60.0%
	Total	**9**	**7**	**77.8%**

Table 2: DASS's interview guide: Topics and questions

SN	Topic	Sub-Topic	Related Questions
1	Driver Registration Process	NIL	What are the requirements for driver registration? Which method is used to verify the attachments if any?

Table 3: HoD' interview guide: Topics and questions

SN	Topic	Sub-Topic	Related Questions
1	Drivers 'Record Maintenance	Record Keeping and Retrieval	How are the Instructors Assessment Reports stored? Which procedure is used to retrieve the record of the old Assessment Reports? What are the challenges faced in record keeping and retrieval?
		Record Backup and Recovery	What are the backup strategies for the Assessment Records? What is the recovery technique in case of data loss?
2	Drivers 'Assessment Result Analysis	Result Verification	Which verification is done to ensure that each driver has been assessed? How are the practical assessment ratings justified to others?
		Result Analysis	Which analysis is done to the driver assessment results? Which technique is used to analyse the driver assessment results? What is the drawback of the result analysis approach used?

Table 4: NIT-CDI's interview guide: Topics and questions

SN	Topic	Sub-Topic	Related Questions
1	Driver Assessment	Driver Verification	How are the drivers' details verified during assessment? How accurate is verification technique used?
		Assessment Method and Tool.	Which method is used to assess the drivers 'practical skills? Which tool is used to record and rate the scores in practical assessment? What are the drawbacks related to the tool?
2	Drivers' Results Reporting	NIL	What is the procedure for communicating driver rating results to the authority? What are the challenges of the communication procedure used?

3.3 Validity and Reliability

To ensure the rigor and reliability of the study, the interview guide underwent comprehensive pre-testing to refine and validate the clarity and relevance of the structured questions. Member checking was also implemented, allowing participants to review and validate the summarized responses to confirm their alignment with their perspectives. Data analysis involved independent verification by members of the research team, followed by consensus-building to ensure consistency. Regular meetings and deliberations were conducted to address and resolve any interpretive discrepancies, thereby ensuring a robust and dependable analytical process.

3.4 Data Analysis

Content analysis was done to systematically categorize and interpret textual data to identify patterns where the thematic analysis was also used to identify the repeated information. Furthermore, Interpretive Phenomenological Analysis (IPA) was also applied to understand how individuals make sense of their experiences. This was purposely applied due to the fact that the content obtained from participants was subjective in nature.

3.5 Ethical Consideration

Ethical consideration was highly taken into account by the research team in the entire process starting from data collection to report writing. Consent of the participants was considered by informing them on the motive of the research whereas confidentiality and anonymity of the participants were also considered. Moreover, manipulation and bias of the information were strictly avoided by the research team.

4. RESULTS

This section presents the results obtained from the conducted interviews. The results are mainly presented in the sub-sections which were categorized based on the topics and sub-topics presented in Table 2,3 and 4.

4.1 Driver Registration Process

The responses from the DASS office highlighted that the drivers are required to present a valid driving licence and a payment slip for the course they have applied for in order to complete registration. However, the responses showed that the payment slip is verified by the internal system since the payment is done to the institute. The verification of the driver details is done by eye-scanning of the driver's name and licence number written on the driving licence card and the comparison is done by the Police when the driver is attending the competence test. One the office members said that "*The institute does not have direct access to the drivers' information since the information are owned by a different authority".*

4.2 Record keeping and Retrieval

The responses from the HoDs revealed that the training assessment reports are mainly stored in physical files after being received from the responsible NIT-CDIs. However, these reports can only be retrieved through direct physical access to the files in the location where they are stored.

The HoDs also reported that the main challenges faced in recording keeping include misplacement of records and in some cases missing reporter identity due to forgotten signature. However, it was also stated that there is a challenge during record retrieval which is time wastage to retrieve records and dust exposure when needed to retrieve older records. One member insisted that "*When retrieving very old records, they may contain strains which may affect the readability of the records*".

4.3 Record Backup & Recovery

The responses from the HoDs have revealed that the backup strategies for the training assessment records in case of disaster is not set rather the paper containing the records are stored in files stored in shelves hence there is a risk of losing the records once a disaster incident occurs in the office. However, it was revealed that there is only backup for the final test assessment results record which are normally keyed in to the computer by the secretary hence providing backup copies in computer as well as on paper. Since there are no backup for the other assessments done during practical trainings, then it is so far impossible to retrieve back the records once lost.

4.4 Assessment Results Verification

The responses have shown that to verify that each driver has attended the training assessment the HoD has to interrogate the NIT-CDIs and drivers to obtain a verification from them whenever a need arises. The HoD insisted that the process is time consuming and not much reliable as it is not done on daily basis hence an incident might happen in between.

On the point of justification of the assessment ratings, the HoD said that it is difficult to justify the drivers' ratings since the evidence of the rating decision cannot be fully retrieved using a paper. One of the HoDs said that "*A driver may fail to maintain lane discipline and make proper use of side mirrors during practical assessment, but the evidence for such an incident cannot be easily retrieved to prove that the driver failed to maintain lane discipline and make proper use of side mirrors during assessment, hence we rely much on the NIT-CDIs 'reports".*

4.5 Assessment Result Analysis

The responses have revealed that the analysis of the results is done manually through reading each hardcopy report submitted by the NIT-CDIs to the HoD. The analysis commonly done to the assessment result is mainly on the driver's performance during training by checking reports submitted by different instructors on the same driver. Similarities in ratings and comments records provided by different NIT-CDIs are identified as common trends whereas existence of significant differences among the ratings and comments on the same drivers implies inconsistency among instructors and hence the need for a follow-up is raised.

The responses also show that the analysis technique used poses some drawback since it needs a lot of human attention to identify patterns and consistency since as the number of drivers increases physical searching of individual records stored on paper for each NIT-CDIs report becomes a tiresome exercise. One of the respondents said that "*It is difficult to make a deep analysis on the data presented on paper since the extraction of data presented on paper is not friendly".*

4.6 Driver Verification

The findings from the NIT-CDIs have revealed that the drivers are verified by comparing the names in the driving licence and names in the list provided by the institute. Furthermore, NIT-CDIs have to compare the facial image on the driving licence card with the actual face of the driver under assessment.

However, the responses revealed that the verification process is not fully accurate since the facial images found in driving licence card might be outdated ones hence posing some difficulties in identifying a driver. One of the NIT-CDIs

insisted that *"It is very difficult to verify the identity of the look-alike people by using their facial images printed on a card".*

4.7 Assessment Method and Tools

The findings have shown that the method used for assessing the drivers during practical sessions is mainly observations where the NIT-CDIs used to observe the driver's performance as he drives on the given RTE. The participants also said that the tool used to assess the practical skills of a driver is a checklist containing some aspects which have to be complied by the driver where the instructor has to rate the compliance of the driver with the aspects specified by the tool by ticking and comment on it.

However, the NIT-CDIs said that drawback of the tool include the difficultness in recording the rates and comments as the vehicle is moving where the instructors have to prepare a rough summary report first and finally rewrite the full report which is also time consuming. One of the NIT-CDIs said that "*The assessment tools usage is very challenging since it requires an instructor to note down the events using pen during practical session while ensuring the safety of the vehicle and other road users is maintained"*. Not only that but also another respondent insisted that "*The instructors face difficulties in handling the records since they are stored on paper which could easily get lost or damaged by strains on it.*

4.8 Drivers' Results Reporting

The study revealed that after the practical assessment being done, the NIT-CDIs have to report the results to the HoD for some managerial processes. However, the instructors said that the original copy of the reports are physically handled to the HoD in the form of paper records which have to be filed in physical files. However, instructors may have their own copy as a backup in case of any issue that may later arise.

It was observed that, the communication procedure poses some issues to the NIT-CDIs since the records can easily be misplaced by the instructor, get strains and be handled late since at the time of handling the receiver may not be around. One of the NIT-CDIs insisted that, "*In some cases, it might occur that after the assessment of the drivers, the instructor may get occupied by other activities and forget to handle the report to the HoD on time*".

5. DISCUSSIONS

The research findings have shown that during registration process, the driver details are obtained from the driving license card submitted by the driver where the verification process appears to be weak since it gives a room for impersonation during training as one driver can attend training on behalf of another a case similar to Regula Forensics [31] who described the weakness in the authentication by using identity card. This highlights the need to introduce a verification approach which will ensure that drivers are accurately identified during practical training done at the institute.

Moreover, the findings have also revealed that there is a challenge in retrieving old assessment result since the records are stored on paper-based files hence record retrieval consumes time and misplacement can easily happened a case similar to the observation made by Maxfiles [32] who also mentioned about data loss and inefficiency as disadvantage of a paper-based system. Furthermore, too old records may contain strains which may reduce readability of the records. Additionally, the backup for the physical paper-based files is also a challenge to the institute an observation which was also implied by DataScope [33] who discussed about the storage challenge of a paper-based system.

The findings have also shown that the assessment process used poses some issues since it is difficult to provide evidence for the observed incidents made by driver under assessment since there are no mechanism for recording and retrieving the road incidents. This is contrary to the automated and simulator-based drivers assessment methods since the methods automatically records the entire process and allows replaying of any incident occurred during assessment [18,22].

Driver assessment result analysis also appears to be a challenge to the HoD according to the findings. This is mainly due to the fact that analysis is done by referring to the records stored on papers and no any analytical tool is used. Hence, identification of various results' pattern and trends have to be done manually by human being rather than system which may result into weak or incorrect analysis an observation which is similar to Maxfiles [32] who identified the difficultness in searching information when using paper-based system which could also result into errors.

Findings have also highlighted that the driver verification during training is done by NIT-CDIs who have to compare the image in the driving licence card with the actual driver since he has no access to any verification source or system. This approach introduces the chances for impersonation of the driver during assessment and result into invalid assessment since one driver can be assessed on behalf of another a case similar to experience to Regula Forensics [31] who highlighted challenges associated with the use of ID card.

A drawback has been revealed on the assessment tool used which is paper-based, since writing a report on the observed incidents using pen and paper while the vehicle is moving becomes difficult hence forces the instructors to write few and very short comments contrary to automated and simulator-based methods which automatically records all the failed attempt during the assessment process. Additionally, the NIT-CDIs have to physically handle the assessment results records to the authority upon completion of the assessment process an approach which may result into delayed submission in case the instructor is occupied in between and loss of records due to misplacement of files [32]. This experience is contrary to automated and simulator-based methods which record all the incidents and save the results automatically [18].

6. CONCLUSION

This research has shed light on the practice that is currently taking place in registering drivers for the courses, practical assessment and management of drivers' information at NIT. The findings have shown that the drivers verification process provides chances for the impersonation of drivers during practical training whereas the paper-based driver practical assessment tool limits the NIT-CDIs from recording detailed information and does not support attachment of the references that can be used as evidence to important incidents occurring during practical training. Furthermore, the tool also limits the management from making an in-depth analysis of the drivers' practical assessment results recorded by the NIT-CDIs.

Hence, the research has proposed algorithms that could be used to improve the accuracy of the registration and verification processes, evidence to the practical assessment processes as well as providing the proper mechanism for handling driver information records which could support in-depth analysis of the practical results and in turn provide support for decision making and improvement of the drivers 'practical assessment process. Further researches are needed to study the driver training practices in other institutes in Tanzania and recommend better, affordable and more effective approaches for handling drivers' trainings which could finally lead into more qualified drivers and reduce the RTAs and RTIs in Tanzania and globally.

7. PROPOSED SYSTEM ALGORITHMS

This section presents the recommended algorithms which could be implemented in the drivers' registration and identification during practical assessment. Furthermore, the algorithms provide more appropriate approaches for the justifications of the assessment process and the NIT-CDIs 'assessment results to the NIT management and other stakeholders.

7.1 Drivers Registration

To ensure that the driver details are correctly verified, there is a need to have a system in place which could link to Tanzania Revenue Authority (TRA) which is responsible for provision of driving license in Tanzania. The DASS should scan the driver's information to the system linked to Tanzania Revenue Authority Database (TRA-DB) and verify the validity of the driver's information before the record is stored in the NIT-Database (NIT-DB). The algorithm for the registration process of the drivers is presented in Figure 1.

Step1: Scan the driver license card details

Step2: Check for the validity of the driver licence details in TRA-DB

Step3: If valid, go to step 4 else go to step 8

Step4: Check for driver course fee payment in NIT-DB

Step5: If driver course fee paid go to step 6 else go to step 8

Step6: Take the current facial image of the driver

Step7: Store driver details along with the image in NIT-DB

Step8: Stop

Figure 1: Drivers' registration algorithm

Step1: Scan the driver image using tablet camera

Step2: Check for the driver registration details in NIT-DB

Step3: If registered go to step 4 else go for Registration Process (Figure 1)

Step4: Auto-record the current time stamp and location.

Step5: Record assessment rates for the driver

Step6: Attach relevant picture or short video if any.

Step7: Submit the assessment rates to NIT-DB

Step8: Auto-record the current time stamp, location and path used during assessment

Step9: Stop

Figure 2: Driver verification and assessment recording algorithm

7.2 Drivers' Verification and Assessment Recording

To avoid drivers' impersonation during assessment process, the NIT-CDIs should scan the driver's image using tablet camera and check with the records stored in the NIT-DB to verify the driver's ID. The system should also record assessment rates and attach a picture or video whenever needed as evidence of the process. Furthermore, the system should also scan the path used during assessment and attach a map showing the route used during assessment. The algorithm for the process is presented in Figure 2.

7.3 Drivers' Assessment Result Analysis

To analyse the driver results, the system should be designed to find out any special patterns or trends on the stored information. The system should fetch the stored assessment records based on either NIT-CDI name, driver details, assessment date, location used for assessment or any other relevant information depending on needs. The proper algorithm for drivers' assessment results analysis is presented in Figure 3.

Step1: Receive input for NIT-CDI names, driver details, date or location.

Step2: Query the database based on the input criteria.

Step3: Retrieve the relevant data matching to the input criteria

Step4: Identify trends and deeper insights using statistical or machine learning models.

Step5: Output the results in a user-friendly format such as graphical reports, tabular summaries or narrative insights.

Step6: Stop

Figure 3: Drivers' assessment result analysis algorithm

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