Chinar Chronicles

Newsletter of Regional Training Institute, Jammu

भारतीय लेखापरीक्षा और लेखा विभाग + INDIAN AUDIT AND ACCOUNTS DEPARTMENT

लोकहितार्थ सत्यनिष्ठा
Dedicated to Truth in Public Interest

In This Issue

From the Director General's Desk

Dear Reader,

In spring this year, our RTI Team brought out the <u>first edition of the 'Chinar Chronicles' newsletter</u> showcasing the achievements and initiatives of the Institute in FY 2019-20. We are grateful for the positive response and feedback on the newsletter that that we received from colleagues in the IAAD.

I am happy to now share with you the mid-year issue of 'Chinar Chronicles'.

We are now in autumn, and the transition of the seasons provides a comforting sense of steadiness in a year characterized by so many unprecedented changes.

As Heraclitus wrote, the only constant in life is change and indeed, this year has seen an up-ending of life as we knew it. Training and work practices moved from an ongoing gradual metamorphosis to a sudden transformation. Sanitizers, face masks and social distancing norms have become ubiquitous in our workplaces and the transition from dog-eared files to email and online work platforms and from in-person to online trainings and remote learning has taken place swiftly over the past months.

The year so far has thus been filled with learning, adaptation and resilience.

This newsletter outlines the work done in delivering all our scheduled trainings online in accordance with the approved Calendar of Training Programmes and the wide ranging knowledge work, research and new initiatives that our team focused on during the half year.

The six months from April to September saw some memorable highlights such as the interactive online workshop on 'Responsible AI and Data Analytics' for 295 trainees across 86 offices in the IAAD organized in collaboration with IIT, Jammu with whom the Institute entered into an MOU in January 2020. Another new initiative was the nine-week internship for second year IIT Jammu students wherein three research projects using AI and data analytics in administration, e-procurement audit and defence audit planning related areas were successfully concluded. The period also saw the preparation/dissemination of 4 case studies and 3 research papers and work continuing apace on the System Automation Initiative (SAI) Training application and the OIOS roll out.

Administratively, besides implementing Covid 19 related precautionary measures, we also carried forward improvements in the infrastructure (both physical and IT related) and green initiatives such as the establishment of a nursery of medicinal (Ayurveda and Unani systems) plants in the RTI.

I remain thankful to the Institute's user offices for their constant support, cooperation and collaboration with us on our initiatives and projects. Our team looks forward to implementing the training programmes and continuing to build upon our knowledge and research initiatives in the remainder of the year.

<div align="center">With regards and warm wishes for the festive season.</div>

Jaya Bhagat

Jaya Bhagat

Chinar Chronicles

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Courses

The Institute imparted training to 416 officers/officials on various topics and skills during the six months from April-September 2020 through 7 online courses/workshops.

The above courses included 4 All India courses conducted upto 26-09-2020 including the all India workshop on 'Responsible AI and Data Analytics' conducted in collaboration with the Indian Institute of Technology, Jammu which was also attended by thirty four (34) IA&AS officers.
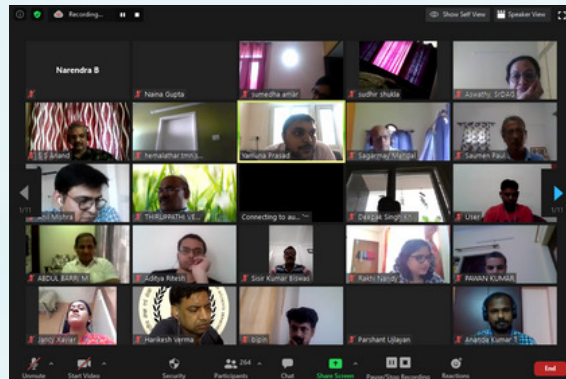
All-India Workshop on 'Responsible AI and Data Analytics' being conducted online

The details of training courses conducted during the half year are as under:

Type of Course	No. of courses	No. of trainees
General	6	121
Information Systems	1	295
Total	7	416

Eminent experts including professors from IIT Jammu and Jammu University, senior officers of the Commercial Tax Department, J&K and Commander Works Engineer, Jammu from the Military Engineer Services were also invited for delivering the lectures.

RTI Jammu's Knowledge Centre covers 4 main themes viz.

1. Defence Audit
2. Audit of Regulatory Bodies
3. New Technology and Skills for the Knowledge Economy
4. Domain Knowledge in Governance in Sectors

The work done by the Knowledge Centre is covered in a separate section in this newsletter

Mid-Year Meeting of the Regional Advisory Committee

Mid-Year Meeting of the Regional Advisory Committee (RAC) for the year 2020-21 was held on 30-09-2020 through Video Conferencing to evaluate the progress made in the first half of the financial year and to discuss the training strategy for the remaining part of the year.

Half Yearly Roundup

The meeting was attended by the following members of RAC/nominated officers/ special invitees viz. heads of branch offices:

1. Mr. Abhishek Gupta, Principal Accountant General (A&E), Jammu, Kashmir and Ladakh (Chairperson)

2. Mr. S K Thakur, Director General of Audit Defence Services, Chandigarh

3. Mr. Vishal Bansal, Principal Accountant General (A&E), Haryana (Additional Charge A&E, Punjab)

4. Ms. Jaya Bhagat, Director General, RTI, Jammu

5. Ms. Ritu Dhillon, Pr. Accountant General (Audit), HP, Shimla

6. Mr. Naveen Singhvi, Director, NAAA, Shimla

7. Ms. Monica Gaur, Director, DGDAS, Chandigarh

8. Ms. Dhanlaxmi Chourasia, Deputy Accountant General O/o PAG(A&E), Haryana

9. Mr. Sumeet Kumar, Deputy Accountant General, O/o Principal Accountant General (Audit), Jammu, Kashmir and Ladakh with additional charge of DADS, Jammu.

10. Mr. Dhruv Bhola, Deputy Director, MAB-IV,Chandigarh,

11. Mr. Sushant Ranjan, DAG, O/o Pr. Accountant General (Audit), HP, Shimla

12. Mr. Ravinder Singh, DAG, office of the Principal Accountant General (Audit), Punjab

13. Mr. R.N. Garg, Deputy Director, F&C, Audit office Kapurthala

14. Ms. Pushpalata, Deputy Director, On behalf of PDA(Central), Chandigarh

15. Ms. Bhanumathi Nathan, DAG, office of AG (A&E), Punjab

16. Mr. C.J Karthi Kumar, DAG, office of AG (A&E), Himachal Pradesh

17. Ms. Sahil Sangwan, Deputy Accountant General O/o PAG(Audit), Haryana

18. Mr. D. D Tripathi, Sr. Audit officer, O/o DGADS(New Delhi)

Mid-Year Meeting of the Regional Advisory Committee

Half Yearly Roundup

The System Automation Initiative (SAI) Training Project

The System Automation Initiative (SAI) Training project is being implemented by the RTI Jammu in 2019-2021. The Project Board overseeing the project consists of DG RTI, Mumbai (Chairperson), DG RTI, Jammu, DGA (Central Railways-Member Secretary), Director, RTC- Delhi and Director, PDA (Central), Bengaluru. The Phase I was rolled out on schedule, in January, 2020, after the project's initiation in September, 2019. The Phase I implemented the automation of the following: Courses and Course Modules including COTP, Nominations, Feedback- session and course, Absentee Report, Certificate generation, Registration of User Profiles, Creation of Faculty database, sharing of course schedule and course material with participants, automatic slot intimation to user offices and intimation to participants.
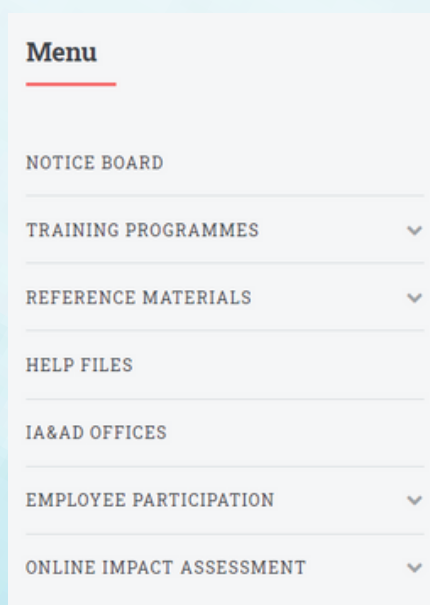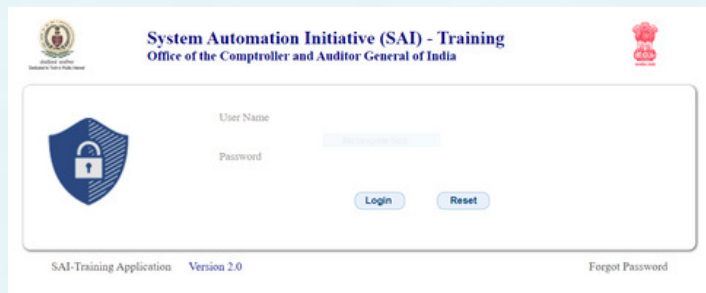
The Phase II of the project, scheduled for completion in October, 2020 includes the following modules viz. Training Needs Analysis (TNA), PDP nomination (tested by RTI Jammu with the SAI team), Impact Evaluation, Legacy data, Training history/database, Training gap analysis etc. For timely and comprehensive roll out of the SAI Project, the nodal officers and teams were identified in all of the Institute's user offices as part of a roll out strategy unique to RTI Jammu and its user offices.

RTI, Jammu shared (29 June, 2020) an update on the new developments in the SAI Training Application with all the user offices. With a view to testing the new modules in respect of online submission of Impact Evaluation forms through SAI, the user offices that sponsored participants for the General Course titled "General Management for Sr. AOs and Group B officers" were also requested to send the forms for evaluation of Impact of training through the SAI application and the evaluation forms are now being received successfully through the application.

A new role and view for the HODs of the user offices (for viewing capacity building Information-Dashboards and MIS reports) has been added in the application and user offices informed accordingly. In response thereto, the HODs of three offices (O/o PAG, Audit, HP and O/o PAG, A&E, HP, O/o PAG, A&E, Haryana), were assigned the role so far.

Half Yearly Roundup

Following a meeting with the Chief Technology Officer (CTO) in August 2020, it was decided that the SAI Training Application which is in the process of undergoing a final security audit, would be handed over to the Headquarters' Training wing for management on completion of the security audit.

One IAAD One System - OIOS

One IAAD One System (OIOS) is a customized end-to-end IT System for the entire IA&AD and aims to fully automate the entire audit process end-to-end viz. audit planning, execution, reporting and follow-up with better and real-time monitoring of the audit process, especially audit execution.

OIOS includes a Knowledge Management System (KMS) that would act as a platform to maintain a repository of documents, media, audit checklists, audit toolkits, and structured data relating to auditable entities.
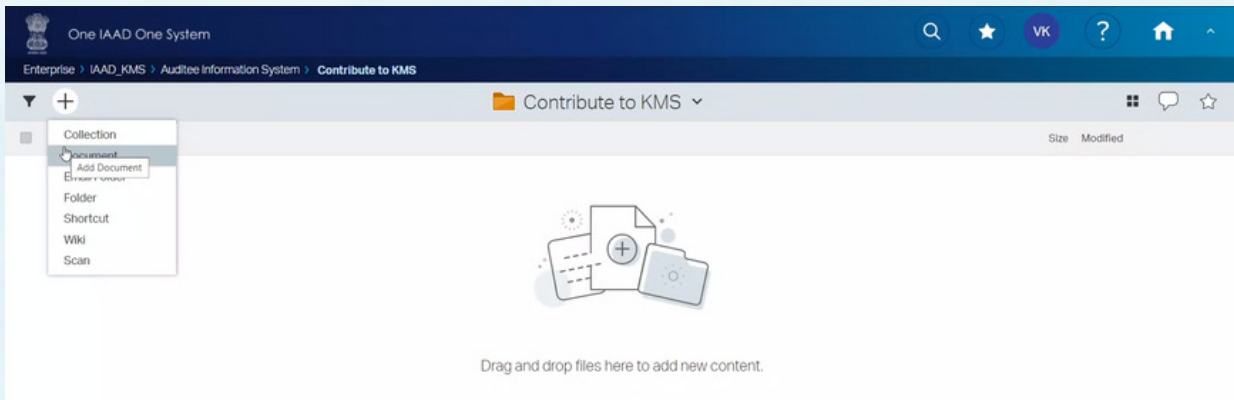
RTI, Jammu, will be responsible for handholding of its user offices for adopting the OIOS and would act as a Functional Helpdesk. A Soft Launch of OIOS for the Office of the Principal Accountant General (Audit), Haryana and five other pilot
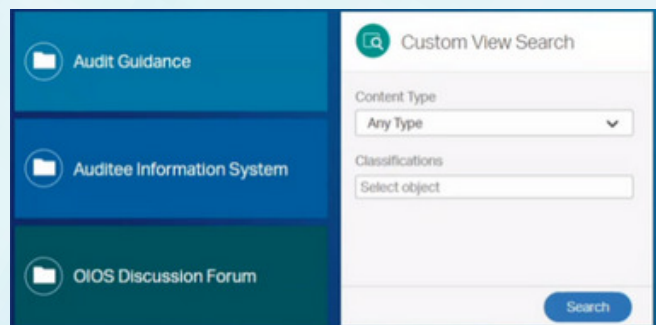
offices across the department was undertaken by Headquarters' office in July-August 2020. The roll out in 65 nodal offices including 3 user offices of RTI Jammu viz. Office of the Principal Accountant General (Audit), Punjab, Office of the Principal Accountant General (Audit), Himachal Pradesh and Branch Office F&C Audit, Kapurthala is expected to take place from the end October-early November 2020.

Half Yearly Roundup

Administration related initiatives

Preventive measures against the spread of the pandemic

The primary focus of the past month (since March 2020) has been on ensuring the proper sanitization and cleanliness of the Institute office and hostel space, so as to prevent the spread of the Covid 19 pandemic. Office space was reorganized so as to ensure social distancing norms were followed and regular temperature checks and wearing of masks were made mandatory. WHO, Ministry of Health and Family Welfare and Headquarters' office Covid 19 prevention related guidance was shared with all staff. Periodic instructions are issued to all support staff in particular so that due care is taken regarding health and safety.

Upgradation of the IT infrastructure and introduction of online working practices

With all trainings of the Institute moving online, steps were taken to strengthen internetconnectivity and all RTI officials were trained in the use of online work platforms as all work (both training and administration related) was moved online.

Hostel and allied extracurricular activities

Besides daily oversight by the caretaker, a thrice weekly Physical inspection system by AAOs and Sr. AOs was in place. With a view towards ensuring the maintenance of a professional environment for all training related activities, earlier in the year, a code of conduct viz. list of 'dos & don'ts' was shared with all trainees and displayed on notice boards and CCTVs were installed on each floor of the hostel, dining room and kitchen for security purposes. Fire-fighting equipment was upgraded and a mobile phone based hostel management app was introduced so as to ensure systemization of management of hostel premises.

The Institute is already a plastic free environment since September 2019. With a view to introducing further environment friendly practices, showcasing the local floriculture and creating an asset for the Institute, the work relating to creating a nursery of medicinal (Ayurveda and Unani systems) plants which had been initiated in March this year. in coordination with the UT Government's Floriculture Department and the Divisional Forest Officer, was carried forward and its expansion is in progress.

Knowledge Centre

Defence Audit

Three (3) All India Training Courses (on-line) were conducted for the officers/officials of Defence Audit offices

Case Studies

1. A case study titled "Induction and exploitation of 'A' a long range Maritime Reconnaissance Anti-Submarine Warfare aircraft", based on the Report No.9 of 2018, of the C&AG of India, Union Government (Navy and Coast Guard), was prepared by this Institute and submitted to Headquarters' office in September 2020 for approval. The case study shall be useful in imparting training to officers/officials of the Defence Audit branch of IAAD.

Image Credit: military-today.com

Image Credit: Indian Navy Twitter handle

Image Credit: economictimes.indiatimes.com

2. A case study on the "Performance Audit of Design, Development, Manufacture and Induction of Light Combat Aircraft (LCA)" based on the Report No.17 of 2015, C&AG of India, Union Government, Defence Services (Air Force) was peer reviewed, approved and disseminated by Headquarters' office in September 2020.

A group of DRAAOs, who underwent induction training in the Institute in 2019, had also prepared a group project and interacted with the members of the audit team that conducted the above mentioned performance audit through video conferencing.

Image Credit: aviation-defence-universe.com

Knowledge Centre

Audit of Regulatory Bodies

Case Study

A case study titled "Activities of Atomic Energy Regulatory Board (AERB)", based on the Report No.9 of 2012, of the C&AG of India, Union Government (Scientific Department), which was prepared by this Institute in collaboration with the office of the Principal Director of Audit (Scientific Department), New Delhi, Branch Office Mumbai was approved and disseminated by the Headquarters' office in September 2020. This is the first case study of its kind in this domain.

The case study had also been piloted in the All India training course on Audit of Regulatory Bodies conducted by the Institute in February 2020 and was appreciated by the trainees in their feedback.

Image Credit: aerb.gov.in

Image Credit: zeebiz.com

Image Credit: downtoearth.org.in

Knowledge Centre

Domain Knowledge in Governance in Sectors

RTI Jammu was allocated the Knowledge Centre theme of 'Domain Knowledge in Governance in Sectors' in 2019-20. The DG, RTI Jammu participated in a panel discussion on 'Covid-19 and India's Pandemic Preparedness and Response' organized by the Centre for Management of Health Services (CMHS), IIM-Ahmedabad on 5 March 2020. This marked the beginning of RTI Jammu's activities under the newly allocated theme.

Case study

To further strengthen the knowledge base related to this theme, this Institute has been continuously interacting with the audit teams (Group Officers incharge and Sr AOs) of the user offices. During such interactions, some interesting topics were shared by these offices. The contents of the Performance Audit report on the "Preparedness for Disaster Management" (Report No.3 of 2017, C&AG of India, Government of Himachal Pradesh) shared by office of the Principal Accountant General (Audit), Himachal Pradesh was found to be an appropriate topic from the point of view of Social Sector Audit and domain knowledge and a case study was approved and disseminated by the Headquarters' office in October 2020.

The case study is expected to be useful in training the participants on domain knowledge of the sector and audit thereof.

Haphazard construction of buildings in Cemetery area of Sanjauli, Shimla, Himachal Pradesh

Image Credit: Report No.3 of 2017, C&AG of India, Government of Himachal Pradesh

The Himachal Pradesh state disaster management cell reported 161 deaths, disruption in 6 National Highways, 300 link roads, 4440 drinking water and irrigation schemes as the torrential rains & landslides paralysed Himachal Pradesh.
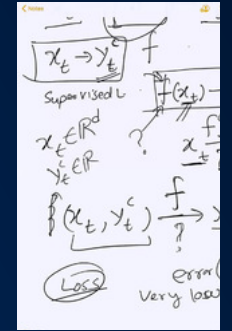*Source: outlookindia.com, 29 August 2020*

Image Credit: outlookindia.com
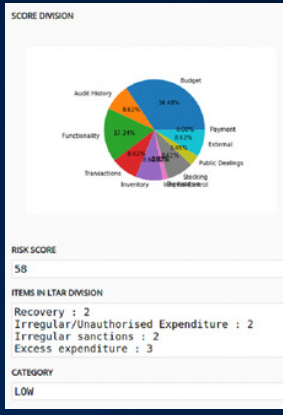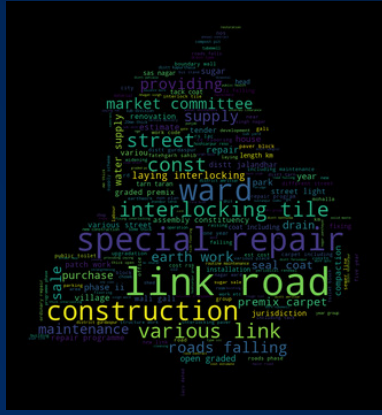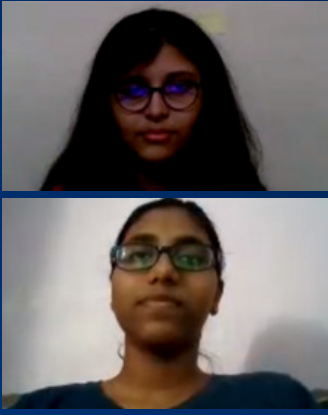
New Technology & Skills for the Knowledge Economy

Knowledge Centre

New Technology and Skills for the Knowledge Economy

RTI Jammu was allocated the Knowledge Centre theme of 'New Technology and Skills in the Knowledge Economy' in 2019-20. In order to strengthen knowledge work and training on the topic, the Institute entered into a collaborative alliance with the Indian Institute of Technology, Jammu whereunder an MoU was signed with the IIT, Jammu with proposed areas of collaboration including webinars, workshops, sourcing faculty for trainings, exploration of internships and special projects, research work etc.

All-India Workshop on Responsible AI and Data Analytics

Following approval by the Regional Advisory Committee and Headquarters' office, the RTI, Jammu successfully conducted an online 3.5 day All India Workshop on 'Responsible AI and Data Analytics' in collaboration with the Indian Institute of Technology (IIT), Jammu from 15.7.2020 to 18.7.2020. The workshop aimed to encourage greater familiarity with & exposure to this important topic across the IAAD.

The workshop received a heartening response with more than 430 requests to participate received from offices. A training cohort of around 295 officers from 86 offices/branch offices across the IAAD were nominated for the training. A total number of 34 IAAS officers (Principal Director and Group Officer level), 92 Sr. AOs, 161 AAOs and 8 other officials attended the training from 18 accounts offices, 60 audit offices including Headquarters office, 7 RTIs and the National Academy of Audit and Accounts. The Principal Director and AAOs from the Kuala Lumpur office also participated in the training in what is the first instance of officers from an office abroad being trained at an RTI.

Knowledge Centre

The 3.5 day workshop covered basic and as well as advanced topics under Artificial Intelligence viz. AI and Machine Learning in Data Driven Decision Making, Data Characteristics and their Measures, Predictive Analytics using Artificial Neural Networks, Regression Techniques in Decision Making, Man-machine Reconciliation in Decision Making, Supervised Learning and Decision Trees, Decisions under Uncertainty, Descriptive v/s Inferential Statistics in Decision Making, Unsupervised Learning in Decision Making and Forecasting Techniques.

In addition to the lectures and mathematical explanations, the workshop also consisted of practical sessions wherein participants were introduced to Weka-a Data Mining and Machine Learning tool and to Machine Learning (ML) programming in Python programming language.
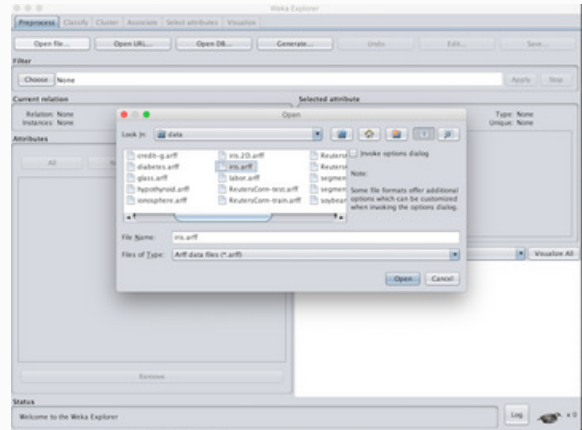
Opening a dataset in Weka

The workshop was very well received by the participants and encouraging feedback in respect of the achievement of objectives, relevance and coverage of topics was shared by the participants.

yes the expectations from this training has been fulfilled. It was a great introduction to the world of AI and Data analytics on which I need to build upon.

Faculty were expert in the topic of training.

The lecture, faculties and topics all were great.

The efforts taken by the DG madam, faculty of RTI, Jammu and the guest lecturers of IIT, Jammu to make the participants understand rather technical terms and concepts in as easy language and way as possible.

The concepts were explained in a lucid way for a heterogeneous audience keeping everyone interested.

Faculties explanation models based and their empirical explanations were excellent.

Hands on demonstration using python.

Basically two things I liked most in the training- the unfathomable knowledge level of the trainers and the coverage of topics with examples.

unusual explanations of mathematical formulae and graph for the algorithms. The working of the algorithms were so nicely explained. Usually, even in IDEA courses, only what is to be done through the software are shown. But here the background working was also explained so elaborately so that we can understand how or what are we doing to the data actually. That was a great experience.

The link to the recorded sessions of the workshop is available on the Institute website. Recorded sessions may also be accessed by clicking here or using the given QR code.

New Initiative
Internship Programme

As a part of the collaborative alliance, RTI, Jammu conducted a nine-week online internship programme for two second year B.Tech students of IIT, Jammu. This was the first such internship programme organized at a training Institute in the IAAD.

As a part of the internship, the interns worked together with the RTI team on three research projects viz

1. An in-house Hostel Management System application for training institutes
2. Data Analytics and Artificial Intelligence project on audit of an eProcurement System (Government of Punjab)
3. Artificial Intelligence Project on Risk Categorization of auditee units (Defence Audit)

The research papers prepared have been submitted to the Headquarters' office for approval.
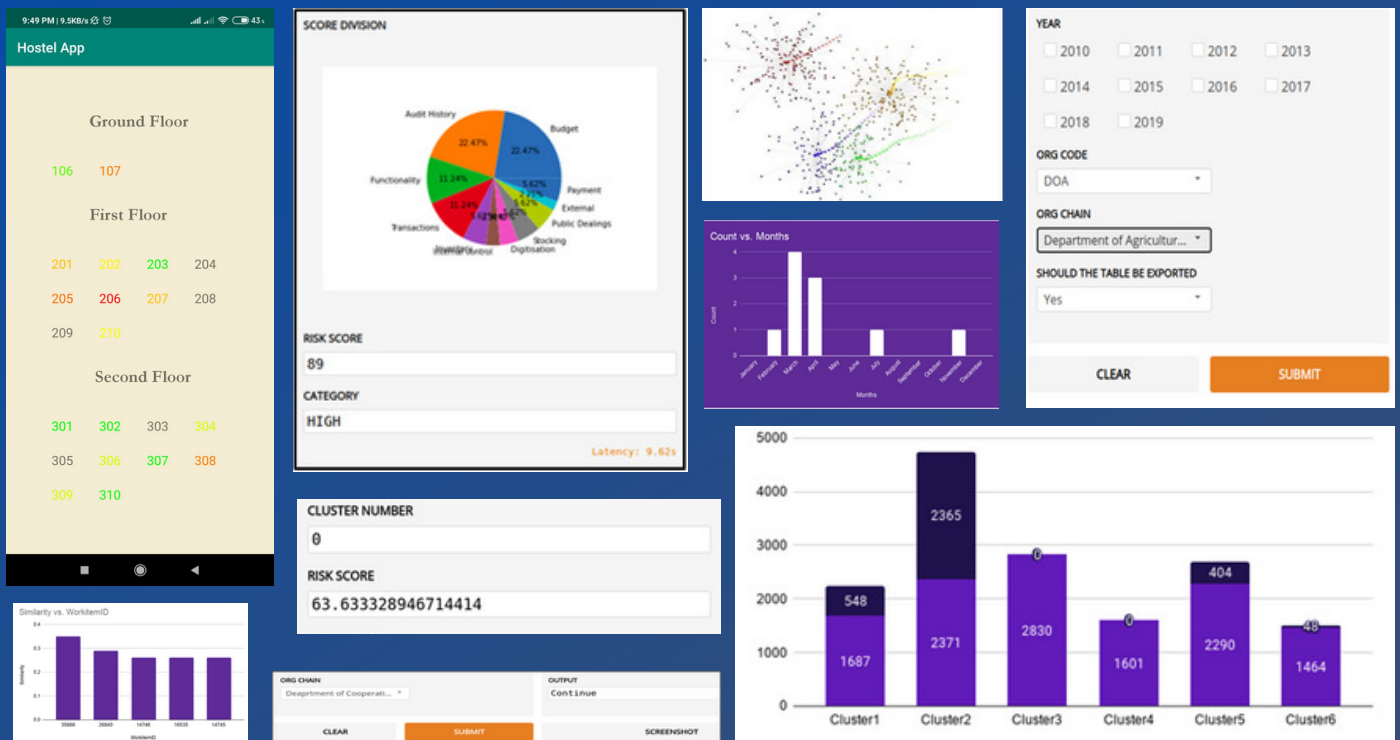
Screenshots of the three projects developed as part of the internship

Hostel Management System

Overview

Regional Training Institute, Jammu has a hostel which caters to the needs of the participants who visit the Institute to attend the courses that are run by the Institute throughout the year. The hostel staff and the administration section oversee the activities related to the hostel such as room allotments, cleanliness and housekeeping of the rooms, quality of the food served to the participants and receipts & payments related to the hostel mess. To streamline the complete process of managing the hostel, a need was felt for a digital platform such as a mobile phone application that would facilitate the flow of the relevant information from the housekeeping/ cleaning staff to the caretaker and from the caretaker to the administration section.

Technology Stack

Android smartphones being economical and widely used, Android platform was chosen for developing the application. The following set of technologies have been used to develop the application:

- Programming Language – Java
- Integrated Development Environment (IDE) – Android Studio
- Database – Cloud Firestore by Firebase
- Cloud Storage – Firebase Storage
- Authentication by Firebase SDK
- Google Forms for unauthenticated input to database.

Requirements & Features

Detailed Software Requirements Specification document explaining the following features was prepared by the RTI Jammu team and was shared with the student interns-

- Allocation of the rooms to the guests based on their designation, gender and the purpose of visit which would be entered in the application by the hostel caretaker while allocating the rooms.
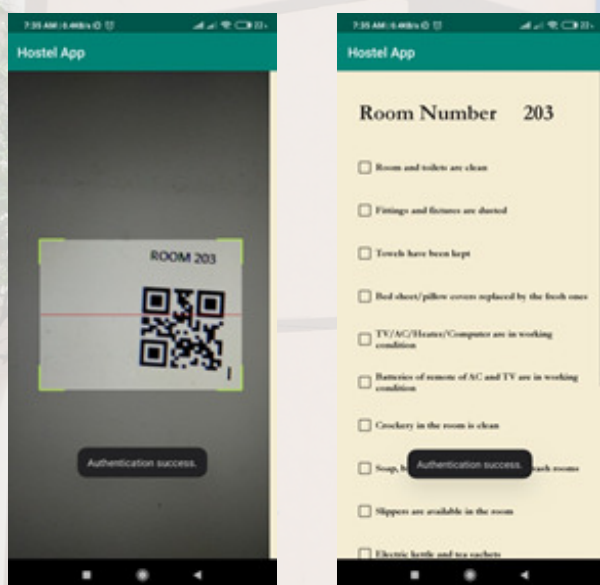

- Complaint submission and redressal – The participants would be able to use the application and the Google Forms to raise their complaints regarding the food and infrastructure in the hostel so that the hostel administration could take corrective action and track pending issues.

Hostel Management System

- Monitoring the housekeeping and the cleanliness of the room – The cleaning and housekeeping staff of the hostel would fill the cleanliness and amenities related checklist for each room using a mobile phone and the caretaker and administration would be able to see the status of the checklist execution for each room.

- Receipt and Payments log – The hostel staff would record the receipts and payments log in respect of the hostel mess using the application. The log would be exportable as a Microsoft Excel workbook.

- Meal Cancellation – The hostel staff would be able to use this application to record the meal cancellation requests made by the participants through Google Forms. This would help the hostel staff to calculate the final amount due from the participants on account of meals consumed during their stay and help avoid wastage of food.
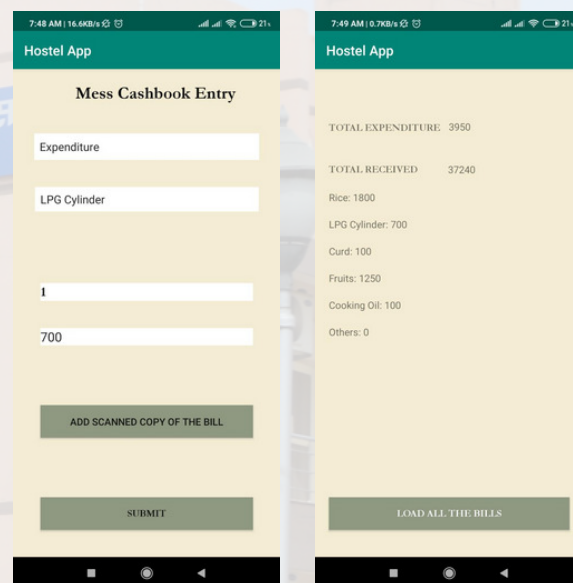

The application has been developed in accordance with the requirements of the RTI, Jammu.

Being an open source application, the source code of the application which has been written in Java programming language can be modified to suit the needs of the other institutes or offices in the department which manage a hostel.

The Institute may kindly be contacted at rtijammu@cag.gov.in for requesting the source code of the application.

Data Analytics and Artificial Intelligence Project on eProcurement System (Govt. of Punjab)

Overview

eProcurement (electronic procurement) is the business-to-business or business-to-consumer or business-to-government purchase and sale of supplies, work, and services through the Internet as well as other information and networking systems, such as electronic data interchange and enterprise resource planning. With the digitization of most of the activities of the government departments, it has become important to upgrade audit techniques used as well. Use of data analytics to derive insights on a smaller dataset is generally sufficient because these datasets generally exhibit trends or patterns that are simpler in nature and are easier to understand. When it comes to working with large databases (such as the one used in this project) that hold data related to multiple departments and offices and large number

of work items, data analytics may not succeed in comprehensively detecting useful or correct patterns from the voluminous data. Therefore the RTI team sought to prepare a module that would enable analysis of data relating to procurement procedures using Artificial Intelligence.

Objective

The objective of this project was to enhance the efficiency of audit teams by equipping them with an analytical tool that might help them to ascertain whether an adequate system was in place in the auditee units with regard to efficiency and transparency in public procurement.

Participating Offices

This project was prepared by the Institute in collaboration with the Indian Institute of Technology, Jammu as part of the nine-week online internship programme for two second year B.Tech students of IIT, Jammu.

The database for the project was provided by the Office of the Principal Accountant General (Audit), Punjab.

About the Database

The database of the Punjab Government eProcurement System was used in the project. The database was maintained as a

Data Analytics and Artificial Intelligence Project on eProcurement System (Govt. of Punjab)

PostgreSQL DB which is an open-source database. The database contained the tenders for all the major departments of the Punjab Government including the PWD, Agriculture, Food Civil Supplies and Consumer Affairs, Housing and Urban Development, Power, Local Government, Transport and Water Resources departments. The total size of the database was 4.3 GB and the database consisted of 1034 tables (including the master tables). Based on preliminary analysis, the following tables were identified for use in the project:

1. gep_tender_work_items - The table contained tender ID, work item reference number, tender title, work description, tender value, tender validity, tender inviting officer and other information pertaining to a tender.

2. gep_bids - The table contained tenderer ID, work item ID, bid reference ID, bid status, bid rank and other details of the bids placed through the eProcurement System.

3. gep_bid_aoc_details - The table contained bid ID and bid award value of the successful bids.

4. gep_tenderer - The table contained the details about the firms and contractors registered in the eProcurement System.

5. gep_tender_basic_details - The table contained basic details about the tenders including the tender reference number and tender ID.

6. gep_orgchain_master - This was a master table which contained information about the departments that invite tenders through the eProcurement System.

7. gep_product_category - This was a master table that contained the types of the works and services and their associated IDs used in the eProcurement System.

Technology Stack

Database - The PostgreSQL Database was used to import the original data dump and for preliminary analysis of the data.

Programming Language - The Python Programming Language was used for all the programming done in the project.

Libraries used included Pandas, Numpy, Gradio, Datetime, Sklearn, Matplotlib etc.

Jupyter Lab was used for integrating all the code for the project.

Features of the Project

This project, along with demonstrating the application of basic data analytics to point out discrepancies in the data and the lack of controls in the IT System being used for the purpose of maintaining the data, also demonstrated the application of Machine learning in the field of audit. This was done with the help of different modules that were developed based on the audit criteria adopted while auditing any eProcurement activities of a government department.

Data Analytics and Artificial Intelligence Project on eProcurement System (Govt. of Punjab)

The modules developed using the Machine Learning algorithms performed the following functions:

- Identifying similar work items for a selected work item to spotlight splitting in bids
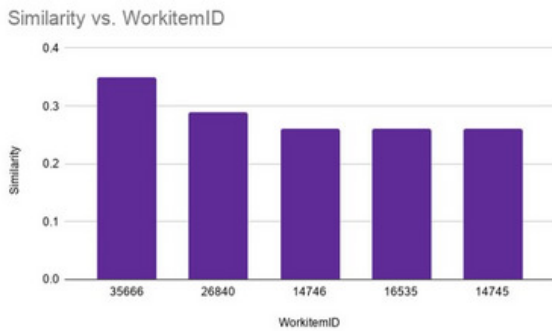
Bar charts depicting the 'degree of similarity of the predicted workitems and the selected work item' and 'month-wise number of similar works issued'

- Clustering the tenders based on the differences between L1 & L2 and L1 & L3

- Clustering the tenders using Gaussian Mixture Models based on the awarded values to point out unrealistic awarded values
- Clustering the tenders based on the bid ranks and work item ids to identify invalid entries in the database.

Usefulness for Field Offices

The project would help support audit investigations by way of scientific analyses of the process of handling public procurement by the Government when this has been automated and includes process re-engineering.

The project also would help auditors to ascertain whether the eProcurement system helped the Government obtain a clear/unambiguous picture of its procurement activities on a real-time basis. The project would also enable a better audit focussed identification of risk areas by the auditors.

Risk Categorization and Audit Planning of Auditee units in Defence Audit

Overview

The Defence Audit Branch of the Indian Audit and Accounts Department (IAAD) is responsible for the statutory audit of various establishments of the Defence organizations in India. Transaction audit is carried out as per the schedule of the audit programmes approved by the concerned Heads of Department (HoD). Subsequently, audit is carried out by the parties nominated by the respective field offices under whose span of audit control the unit or formation falls. For quality output in terms of substantive audit observations, audit planning based on risk categorization plays an important role in the process of selection of units.

Objective

One of the main challenges faced by auditors is how to allocate limited audit resources in the most effective way and how to optimize the available resources for deriving desired results to the maximum extent. This requires an assessment of risk across all the auditable areas that an auditor might examine. The objective of risk-based planning is to ensure that the auditor examines subjects with the highest risk in conformity with the best practices in public sector auditing, thereby ensuring a scientific audit approach. The Strategic and Annual Audit plans must be developed through a process that identifies and prioritizes the selection of potential audit units based on risk parameters. The objective of this project is to use Data

Analytics and Artificial Intelligence to facilitate and systemize the risk categorization of auditable units in defence sector from an audit planning perspective.

Participating Offices

This project has been prepared by the Institute in collaboration with the Indian Institute of Technology, Jammu (as part of the nine-week online internship programme for two second year B.Tech students of IIT, Jammu) and branch office of the Director of Audit, Defence Services, Northern Command, Jammu (coming under the administrative control of the Director General of Audit, Defence Services, Chandigarh).

About the Dataset

The Local Test Audit Reports (LTARs) form the major part of the dataset used in the project. A representative set of 31 LTARs in .docx format were shared by the office of the Director of Audit, Defence Services, Northern Command, Jammu.

Further, risk scores of the auditee units were tabulated based on an identification of the risk factors that underpin any audit planning.

Thus, the input data for the application consisted of :-

- LTARs containing audit paragraph items labelled according to the associated parameter, viz., fraud/ embezzlement. contractual violation, recovery, regularity issues, accounting deficiency etc.

Risk Categorization and Audit Planning of Auditee units in Defence Audit

- Microsoft Excel Workbook containing the list of all the auditee units and the risk score for all the risk factors.

Technology Stack

Programming Language - The Python Programming Language has been used for all the programming done in the project.

Libraries used include Pandas, Numpy, Datetime, Pickle, Openpyxl, Docx, Keras, and Nltk.

Jupyter Lab has been used for integrating all the code for the project.

Features of the Project

The risk categorization of the auditee units is calculated based on the Risk Matrix which comprises various risk factors, elements of risk involved and the parameters of the risk , viz., budget outlay, functional role, inventory, stocking of stores in the units, conclusion and execution of contracts, payments made to third party, units etc.

The application program developed employs Machine Learning to use the Risk Matrix and the audit paragraph items of the respective Local Test Audit Reports (LTARs) for the categorization of the Auditee units.

Based on the input data, the application can perform the following functions:-

- Calculate the Risk Score for a Unit depicting the contribution of each risk factor and categorising the unit as "HIGH", " MEDIUM" or "LOW" risk type.

- Calculate the risk score and risk type of multiple units and plot the number of units in each risk type.
- Predict the parameter associated with the audit paragraph using the trained Long Short Term Memory (LSTM) model. If the prediction is incorrect, the user can provide the correct label and retrain the model.
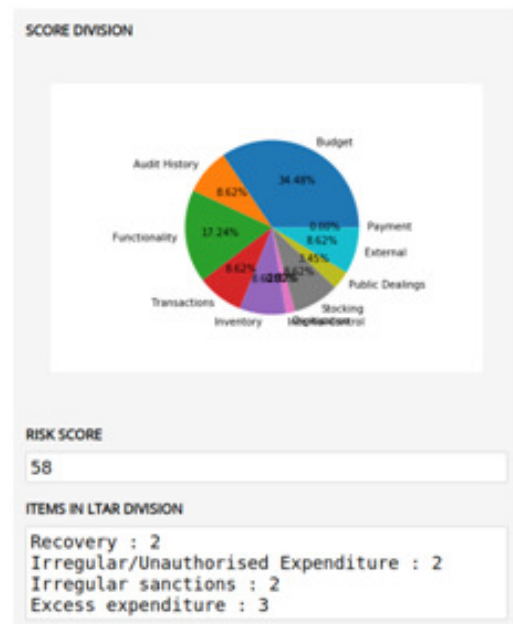
Pie chart depicting the contribution of each risk factor to the risk score; Risk score of the unit; Parameters associated with the para items in the LTAR.
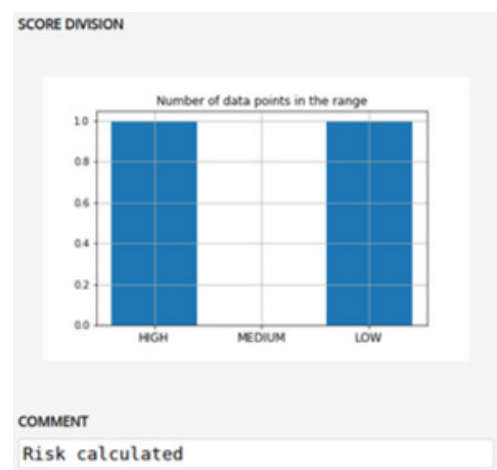
A bar graph showing the number of Units in each risk type

Risk Categorization and Audit Planning of Auditee units in Defence Audit

- Provide the option to add new parameters for audit history risk factors. Similarly, the user can add a new type of unit and enter the associated risk score.

Adding a new category for para items

Adding a new type of Functional Unit

Usefulness for Field Offices

The results regarding categorization of auditee units and identification of audit history parameters associated with the audit paragraph items were found to be accurate for the test data which was produced by augmenting the original 31 LTARs provided by the Office of the Director of Audit, Defence Services, Northern Command, Jammu. The programme thus, may be trained iteratively by adding more LTARs of various offices in the training data thereby enabling further accurate results generation for different kinds of auditee units.

The complete programming of the 'Data Analytics and Artificial Intelligence Project on eProcurement System (Govt. of Punjab)' & 'Risk Categorization and Audit Planning of Auditee units in Defence Audit' projects has been done in the Python programming language. Python is the most commonly used programming language in AI and Machine Learning applications due to the availability of a number of useful libraries and associated documentation.

The Institute may kindly be contacted at rtijammu@cag.gov.in for requesting the source code of the projects. The source code can thereafter be further worked on and adopted to suit the requirements of auditing in specific offices.

Upcoming Training Courses

General Courses

1.	Workshop on high value contract and contract management (As Knowledge Centre for Defence audit)	19-10-2020 to 21-10-2020
2.	Workshop on RTI Act and its Application	03-11-2020 to 04-11-2020
3.	Administrative Issues	16-11-2020 to 20-11-2020
4.	Audit of Direct Taxes for Group B officers and Sr. AOs (at Chandigarh)	11-01-2021 to 15-01-2021
5.	PFMS and Issues and challenges in the implementation of IFMS	25-01-2021 to 30-01-2021
6.	Audit of Regulatory Bodies	15-02-2021 to 19-02-2021
7.	Workshop on procedure of management /formulations in DRDO (As Knowledge Centre for Defence Audit) to be held at Pune	15-03-2021 (1 day workshop)
8.	Workshop on stores and Purchase management in DRDO (As Knowledge Centre for Defence audit) to be held at Pune	16-03-2021 (1 day workshop)
9.	Training for RAE-2 revised paper on GST (to be held at Chandigarh)	To be decided by the Headquarters' office
10.	Induction training for DRAAOs	To be decided by the Headquarters' office

Information Technology Courses

1.	Audit in IT Environment	14-12-2020 to 19-12-2020
2.	Data Analytics Knime and Tableau	01-02-2021 to 05-02-2021

Regional Training Institute, Jammu

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