



Pursuit

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International Centre for Information Systems and Audit (iCISA)

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About the Journal

PursuIT, the e-Journal, is a platform for sharing of experience and inculcating professional excellence in the emerging areas in the domain of Information Technology. e-Journal aims at having features on emerging areas of Information Technology viz. cybersecurity, Data Security, e-Governance etc. It also looks into the technological developments, future of technology, national policies and standards, as well as articles on IT Audit conducted by SAI India.

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We strive for constant improvement and encourage our readers to provide their valuable feedback/suggestions to make the endeavor successful. Send us your suggestions, comments, and questions about the e-Journal to icisa@cag.gov.in

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To support this initiative of e-Journal, we welcome you to contribute electronic submission of articles from emerging areas in the domain of Information Technology. The article should be relevant to the theme of the upcoming e-Journal and should be in the range of 1000 to 3000 words. All submissions should be accompanied by a short profile of the author. The article is to be sent to icisa@cag.gov.in.

Director General's Message

PursuIT, the e-Journal of iCISA, is committed to investigating new avenues in information technology auditing, with the intention of broadening the range of knowledge domains of IA&AD personnel and encouraging experience sharing.

This is PursuIT's eighth issue, and hopefully, this issue will pique readers' interest in contemporary IT concerns and increase their knowledge base.

I thank the writers and Editorial Board members for their wonderful contributions. I look forward to receiving insightful recommendations from the readers for improving PursuIT, the e-Journal, in future releases.



Ms. Keerti Tewari,
*Additional Deputy CAG &
Director General, iCISA*



1. Smart Contracts- The Challenges and Opportunities

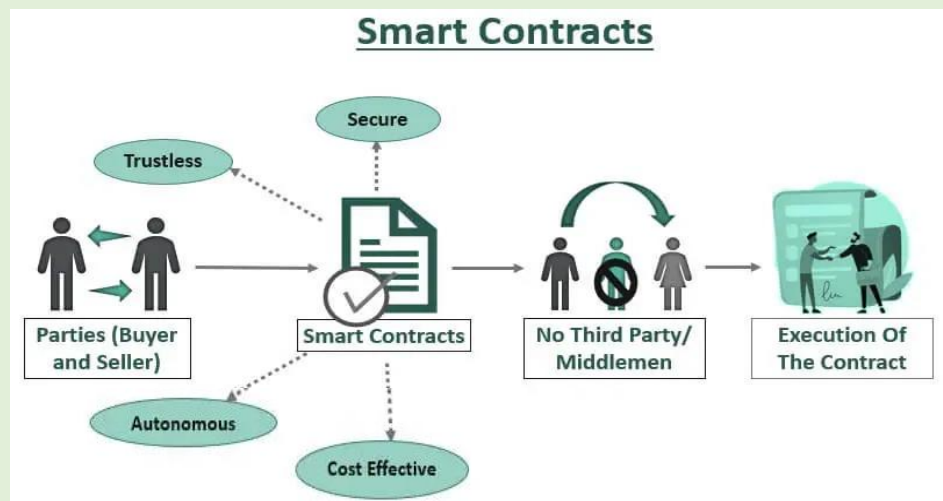
Ms. Stefi Sofi, IAAS, Deputy Secretary, NRA-DoPT

The article below aims to explain the concept of smart contracts and their major features. The later part of the article explains the potential of smart audit procedures and the key focus areas in the audit of smart contracts.

Smart Contracts

A smart contract is a self-executing, digitally encrypted contract based on block chain

technology. Smart contract is executed through block chain network which has the potential to maintain a decentralised and secure record of crypto transactions. It was Nick Szabo, a legal scholar and cryptographer, who introduced the concept of smart contract way back in 1990s.



In a smart contract, the contractual parties decide on the terms/ conditions of the contract and these terms/conditions are translated into programming code. The code is stored in the block chain system and is shared among the participants in the block chain network. If the code is verified by all the participants in the network, the code would automatically execute transactions based on if-then logic.

The potential of smart contract to execute transactions on its own minimises the need of intermediaries. In other ways, the smart contract, fused with block chain technology, brings in the concept of **restlessness** i.e., trust in human beings is eliminated from business transactions.

The essential features of a smart contract can be summarised as below:

1. The transactions under smart contracts are **immutable**.
2. The transactions being recorded on the **decentralised ledger** in the block chain network, it is very difficult or nearly impossible to alter the code as it is maintained and executed by every participating node.
3. Smart contracts leave a more transparent **audit trail**.
4. Smart contracts are **self-enforcing** when the conditions in the contract are met.
5. Smart contracts do not require third party intermediaries and the final outcome of the smart contract would not alter whoever executes the contract.

Owing to these features, smart contracts have become the latest ground breaking technological force that can transform the supply chain and financial industry business practices.

Ethereum, the open-source block chain conceived by Vitalik Buterin in 2013 allows for smart contract functionality. As per the latest records, more than 44 million smart contracts have been deployed since the genesis of Ethereum. Other top smart contract platforms include Solana, Avalanche and Algorand.

Smart Contracts in India

A large number of smart contract developers/developing firms are available all over the world. In India, firms such as M/s Wipro, M/s Capgemini, M/s TCS and M/s

Nine Hertz have already developed cutting edge smart contracts. However, in India, the ambiguity regarding legality of use of cryptocurrencies pose a few challenges to the usage of smart contracts as well. The provisions of IT Act 2000 permit digital contracts using electronic signature. However, the electronic signature has to be certified by an authority designated by the Government. In this regard, the self-generated digital signature created by the smart contracts may cause issues. Also, admissibility of smart contracts as evidence in a Court of law may be problematic as the provisions of Indian Evidence Act mandates for an electronic document to be considered valid only if it is authenticated with a digital signature.

The governments of Georgia, Illinois, Belarus, United Kingdom etc have already modified the legislations so as to make the block chain based transactions legally valid. Necessary changes to law would have to be initiated before legally accepting the smart contracts. Immediate legal measures are to be taken in this regard as smart contracts have the potential to simplify business transactions in various fields such as healthcare, real estate sector, insurance etc radically reducing the transparency concerns.

Smart contracts- Vulnerabilities

Despite all the advantages explained above, Smart contracts have various vulnerabilities and security flaws which can disrupt the entire network. Smart contracts can have logic errors such as typographical errors, misinterpretation of the specifications etc. Some of the serious smart contract vulnerabilities include Re-entrancy attacks,

Time stamp dependence, Gas- related vulnerabilities etc.

Re-entrancy is a common smart contract vulnerability which can happen when one creates a function that makes a call to an untrusted contract. For example, the attacker contract calls on the victim contract to withdraw funds. The victim contract checks fund balance of the attacker contract and transfer funds to the attacker contract. Before updating the balances of the attacker contract, the attacker contract would again call on the victim contract to transfer the funds. This results in a recursive call draining the victim contract of its entire fund balance. In 2016, the infamous DAO attack which resulted in the transfer of 3.6 million Ether (crypto currency) valued at the time at around 50 Million Dollars included a combination of cyber-attacks including re-entrancy attack. The DAO attack was a watershed moment in the use of block chain-based systems and various studies further pointed out that around 3 percent of Ethereum smart contracts are vulnerable to security breaches. This amplifies the significance of audit of Smart contracts.

Audit of Smart Contracts

The performance of the smart contract is directly linked to the quality of the code and thus, the audit of smart contract entails audit of the code used in the smart contract.

The primary requirement here is that the auditor would have to have a deep and thorough understanding of the block chain technology and the coding work. The auditor,

after gaining sufficient theoretical knowledge, would have to further learn about the common vulnerabilities in the smart contract codes.

To begin with, the smart contract auditor should focus on common coding bugs. The auditor would have to carry out various security tests from the perspective of the attacker (Black Box testing) or may otherwise resort to grey box testing (where the tester has partial knowledge of the system) or white-box testing (test of inner workings of the software system) based on the risk level.

Further, smart contract auditing entails two approaches of auditing. The auditor can carry out a manual code analysis where he / she reviews each line of code to analyse it for errors. This approach can be quite exhaustive in nature. However, it helps to detect hidden risks in the contract architecture and not just the errors in the code. Automatic code analysis can also be chosen where he wants to save the time and effort in checking the code. Automatic code analysis helps find the vulnerabilities very quickly. The market offers a number of audit tools such as Truffle Suite and Populous.

Auditing with Smart Contracts- Smart Audit Procedures

Audit would have to respond to the rapid technological changes in the business environment. Acknowledging the digitalisation of the business processes, audit has embraced various data analytics tools such as IDEA, Tableau etc. However, to improve and

upgrade further to the needs of the auditee, it is imperative that the audit has to consider smart contract based audit analytics (Smart audit procedures as titled in the paper 'Auditing with Smart Contracts by Andrea M. Rozario and Miklos A. Vaserhedlyi 2018). This involves facilitating the execution of audit procedures within the smart contracts. Such audit procedures would be autonomous audit procedures or smart internal control tests that runs on if-then logic. This would help the external auditor to assess the risks in the system and helps him to improve the audit quality.

Smart audit procedures would also require the consensus of all the stakeholders in the block chain network. Further, the results of smart audit procedures should be shared with the relevant stakeholders. The external auditor can carry out a follow-up smart audit procedure that further analyses the deviations. Use of smart audit procedures helps in timely audit reporting also.

One of the essential features of smart audit procedures is that the audit procedure would autonomously run through the smart contract code and perform the internal control tests as configured. Presently, the traditional auditor

would take a sample of the transactions and examine the key provisions of the contract. In a traditional audit, the auditor reviews key deviations based on the set benchmarks (e.g. higher monetary value). A smart audit procedure can also autonomously alert the errors identified beyond the set threshold.

New audit risks can emerge as we use Smart contract based audit procedure. Auditor would have to adopt a hybrid model i.e., a mix of traditional audit procedure and smart audit procedure. Here, he/she would have to decide the areas that are significant for smart audit procedure. Also, the auditor would have to decide the stakeholders whom the results of smart audit procedures are shared with. Updating of the smart audit procedures is another aspect that needs attention. The auditor would have to address the erroneous codes in smart audit procedures also.

Incorporating smart audit procedures in the smart contracts would pave way for more reliable business transactions using smart contracts. Also, this is an inevitable measure that has to be adopted by audit today or tomorrow, so as to keep up with digital transformation in the business world.

References:

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2. Grievance Redressal

Mr. Rahul Kumar, Sr. DAG (Admin & AMG), O/o Pr. AG (Audit) Tripura

Grievance Redressal is a component of overall stakeholder engagement wherein the expected service has not been provided in assured time, quality or content. It refers to the process of addressing and resolving complaints or issues raised by individuals or groups. It involves identifying the problem, investigating the situation, and taking appropriate action to resolve the issue. The goal of grievance redressal is to provide a fair and efficient means for individuals to have their concerns heard and addressed in a timely manner. This is all the more important in case of Entitlement Based Grievances, which is sometimes dealt with by the AG (A&E) offices. There are existing frameworks of acknowledging and addressing Grievances in the offices, however with intervention of IT and IT enabled processes, the frameworks could be made more effective and enhanced.

PAG (A&E) West Bengal, being a citizen centric organisation has taken measures to be responsive to the requirements and expectations of all its stakeholders. The Entitlement functions have further enhanced

the requirement to be aware of the nature of grievances and to provide the measures for effective action.

The office interacts with various stakeholders i.e. (2.6 lakh GPF subscribers, processing 25000 Pensions annually), with more than 1000 AG (A&E) Employee and therefore has large volume of communications regarding grievances. Moreover, the grievance is received through various channels and contain various types of grievance.

The office, to provide timely and adequate redressal of grievance with timely hierarchical monitoring, designed and developed a Web based Grievance Redressal Module using in house expertise without incurring any additional cost and mapped it with the workflow to channelize and monitor the grievance. The existing procedures were analysed and relevant BPR, which was done to broadly adhere with 4R (Recognition, Redressal, Reporting, Remedy). This was a success and the IT solution was adopted by various wings and saw faster turnaround time and better satisfaction of grievance redressal.

Sources of receipt of Grievance in PAG(A&E)



Previously, there was no structured monitoring system in place to monitor the disposal of the Grievances which were received from multiple channels with different protocols of disposal. Instances of some grievances having been delayed significantly or not addressed adequately, may not be completely ruled out. These are very important for large offices which deal with Entitlement issues and receives high volume of such grievances.

Planning

The office had multiple points of grievance recognition and registration system and they had their own protocols and their own mechanisms of recognition, redressal,

reporting. For e.g. Email based grievances were not diarized etc. This created problem where sometimes some grievances were given priority based on RTI enquiries over others. Further, there was no relevant unified data for monitoring the timelines and pendency of the grievances by senior officers. The requirement of a good system was also important, given the disruption of Covid and increased institutional commitment to clear cases in appropriate and timely manner.

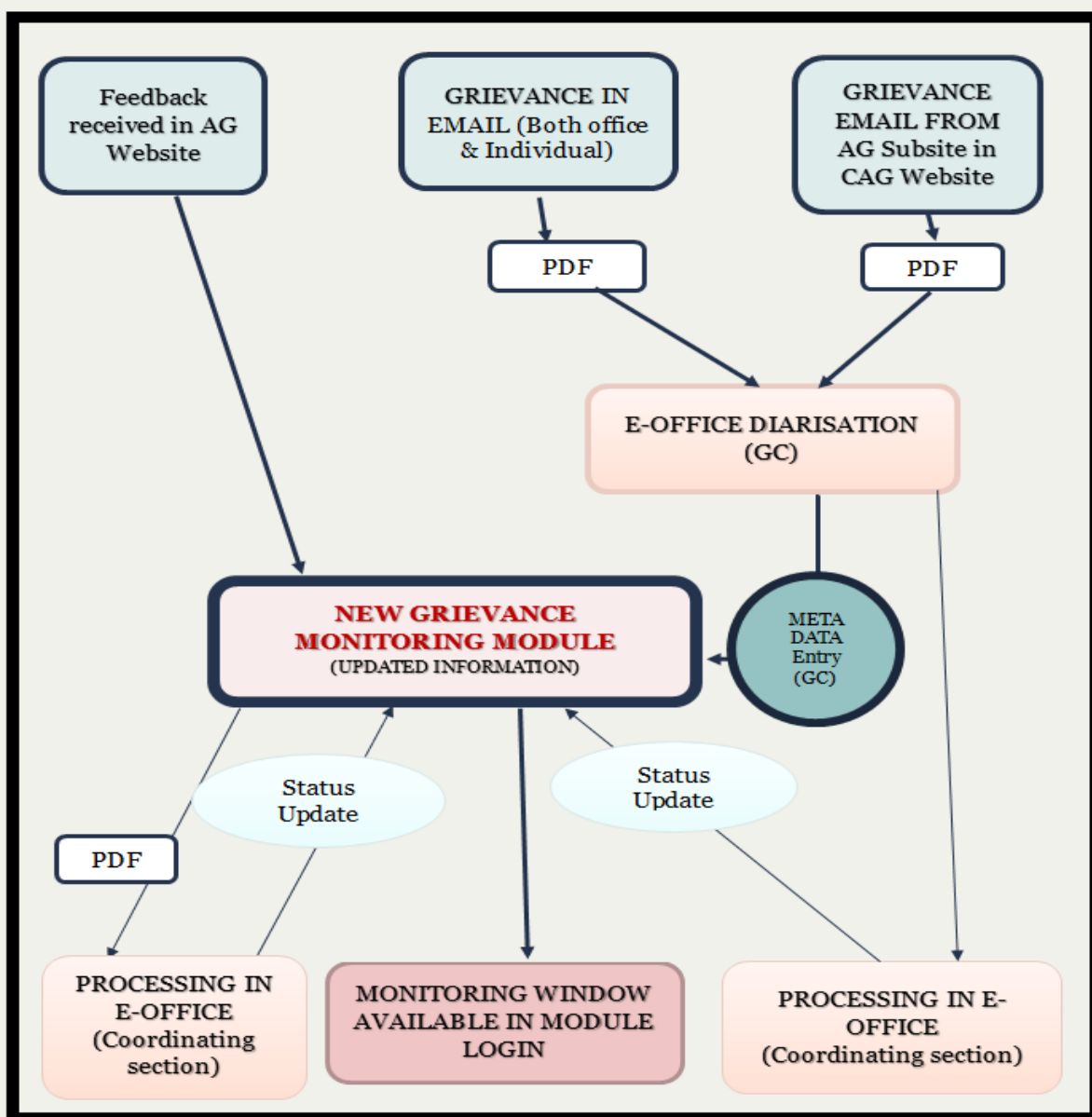
To rectify the same, it was felt necessary to:

- 1) Analyze and map the flow of various Grievance flows which were received in the office.
- 2) Use in house expertise to develop IT based solutions

The in-house team started to code and develop the Module, on Web based Grievance Module based on analysis of the work flow. The Administration Group, in parallel, dealt with the need to have Grievance Node in each functional group (Pension, Fund etc) as single point redressal officer. They were designated as GNO

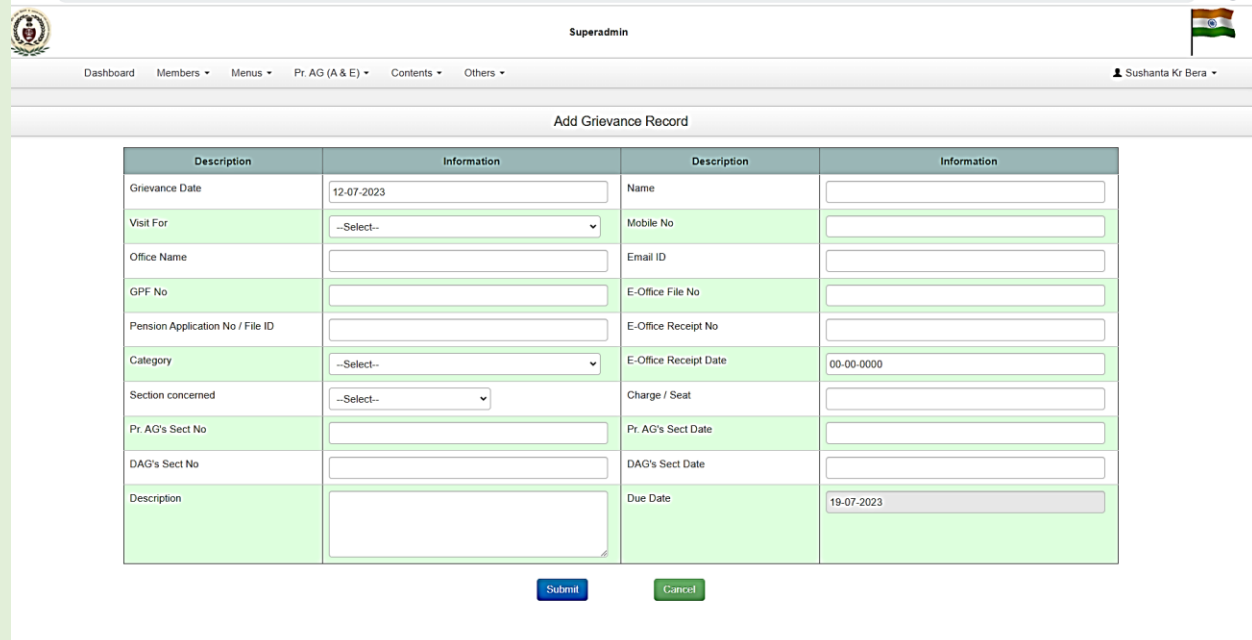
(Grievance Node Officers) in charge of Grievance Nodes (GN) and dedicated email ids (griv-accs.wbl.ae@cag.gov.in, griv-pen.wbl.ae@cag.gov.in , griv-fund.wbl.ae@cag.gov.in , griv-admin.wbl.ae@cag.gov.in) were created for Login and Processing.

Methodology



1. New Dedicated Grievance Cell (GC) in each functional wing viz. Pension, Fund, Accounts, the metadata entries of all email-grievances in the GMM entered and to initiate action in e-Office to those emails which requires administrative processes and forwarded the same to the concerned

section(s). Necessary action(s) on the grievance(s) will be taken by the concerned section(s) of this office and action taken status has to be sent to the GC of the concern wing for the purpose of updating the same in the GMM on daily basis.



Description	Information	Description	Information
Grievance Date	12-07-2023	Name	
Visit For	--Select--	Mobile No	
Office Name		Email ID	
GPF No		E-Office File No	
Pension Application No / File ID		E-Office Receipt No	
Category	--Select--	E-Office Receipt Date	00-00-0000
Section concerned	--Select--	Charge / Seat	
Pr. AG's Sect No		Pr. AG's Sect Date	
DAG's Sect No		DAG's Sect Date	
Description		Due Date	19-07-2023

2. All the Grievances received through office mail/Individual employee's mail are mandatorily to be forwarded to concern GC. There are no separate channels for attending the e-mail Grievances received in this office.

3. Office timelines to be made and monitoring at all levels.

4. The official(s) of the Grievance Cell will also furnish system generated report on the grievance(s) which remain pending more than due date(s) to the concern Coordination Section to expedite the redressal process. Status of disposal of the Grievances will be included in the sectional monthly report.

Principal Accountant General (A & E) » Employee » Feedback

All Grievances / Feedback

Feedback No / Mobile No:

Select Group :

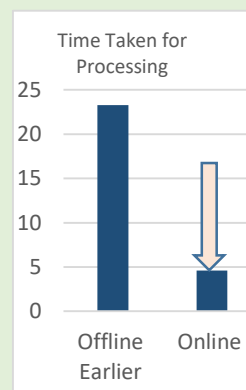
Sl No	ID / Date	Submitted By	Group /GPF No	Description	Status	Action
1	14235 29-06-2022	Subrata Mitra NA	Provident Fund EDN/WB/20768	Registration of mobile number	Process	<input type="button" value="Action"/> <input type="button" value="Close"/>
2	14233 27-06-2022	Bangshi Badan Mondal 7864995224	Provident Fund CPR/WB/34201	Data has been updated in our system. But, it will be uploaded in our Website on today evening. After uploading, you will be able to login in our Website.	Process	<input type="button" value="Action"/> <input type="button" value="Close"/>
3	14232 26-06-2022	Asit Roy 8617033496	Provident Fund WB/AGR/71890	Status GPF final payment	Process	<input type="button" value="Action"/> <input type="button" value="Close"/>
4	14231 25-06-2022	GITA MALLIK 9732317176	Provident Fund HEALTH/WB/25019	GPF MISSING CREDIT OF OCT 2017, MAY 2018 & JUNE 2020	Process 	<input type="button" value="Action"/> <input type="button" value="Close"/>
5	14229 23-06-2022	Sourav Ghosh 9339157852	Provident Fund NA	PF Account Not Opened Yet	Process 	<input type="button" value="Action"/> <input type="button" value="Close"/>
6	14228 21-06-2022	Dr SOURAV GHOSH 9433666613	Provident Fund NA	No GPF Acct No generated	Process 	<input type="button" value="Action"/> <input type="button" value="Close"/>
7	14227 20-06-2022	BRAHMANANDA PAL 9474696748	Provident Fund NA	Missing in account slip on 4/2021 (Rs.15000).	Process 	<input type="button" value="Action"/> <input type="button" value="Close"/>
8	14226 20-06-2022	ASIMA SANPUI(HANRA) 9564460327	Provident Fund MISC/WB/35005	login problem	Process 	<input type="button" value="Action"/> <input type="button" value="Close"/>
9	14225 18-06-2022	Abhijit Maji 7699775400	Pension JUS/WB/18041	Continue GPF Account	Process	<input type="button" value="Action"/> <input type="button" value="Close"/>

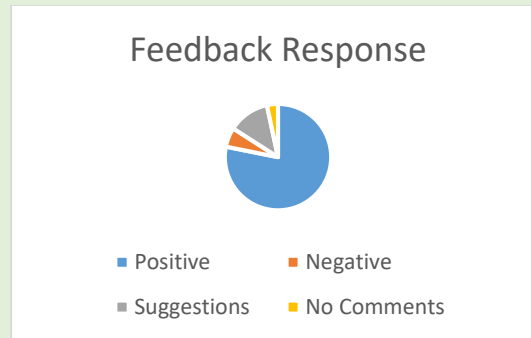
Outcome & Impact

OLD SYSTEM	NEW SYSTEM (MODULE IMPACT)
<ul style="list-style-type: none"> • Writing of submission by the complainant; • Transmission to the AG office either by post or by physically visiting the office; • Receipt in the central receiving section; • Transmission to the Group Co-ordinating section; • Processing in this relevant section; including drafting of reply/action taken; • Transmission to central dispatch section; • Time taken by postal department to deliver the reply to the complainant. 	<ul style="list-style-type: none"> • Registering of complaints online using the Grievances module in the Pr. AG website from anywhere and at any time; • Auto generated email forwarding the complaint to the central email id of this office; • Online forwarding to the dedicated grievances email id of the concerned functional group monitored by Co-ordinating Branch Officer and a dedicated grievances desk officer in the group co-ordinating section. • Online forwarding of the case to the concerned section after its scrutiny and registration in the grievances management module; • Processing and action taken and thereafter issue of reply directly to the complainant with copy to the grievance desk officer. • Scrutiny and monitoring of the action taken/reply furnished along with closing of the grievance/complaint in the grievances management module;

The Time **taken** between earlier offline instances and the online Module mechanism showed significant improvements.

Case Study - The perusal of time taken in a sample of 15 cases of physical redressal of grievances and the 15 cases of redressal in Module showed that the timeline was reduced from an average of **23.26 days** (excluding the postal time in dispatch) to **4.6 days** in the module. There were some instances where the cases were done within a day also.





The **Comments** received in the Feedback in Website demonstrate the dynamism with which the Grievances within them are addressed and the stakeholder satisfaction

with the services. The analysis of Graph “Feedback Responses” for 1 month as received in website is shown in the chart above.

Benefit-

- Integrating various types of Grievance mechanisms and flows
- Linkage between Website based Module and E-Office and Email.
- Time based monitoring of all types of grievances, based on seriousness and HQ norms
- Monitoring and Follow up by DAG of Grievance of the pending grievances
- Single point for analysis of the recurrent type of grievances and possibility of remedial action
- Phase wise extension to all type of representation

Some Screenshots :

	<u>OLD SYSTEM</u>	<u>NEW SYSTEM (MODULE) 's IMPACT</u>
Recognition	<ul style="list-style-type: none"> • Multiple points of receipt of Grievances , so no integrated awareness of amount of Grievances 	<ul style="list-style-type: none"> • Single Entry for Feedback and Grievances and unified platform for reporting
Redressal	<ul style="list-style-type: none"> • Timeliness of Grievances and feedback were not able to be followed properly, as each was processed in single physical file . 	<ul style="list-style-type: none"> • Timeline norms which were not existing earlier were made and enabled to be followed (the details given in Graphs)
Reporting	<ul style="list-style-type: none"> • No register of pending grievances and No method of putting information to DAGs or monitoring by DAGs and PAG. 	<ul style="list-style-type: none"> • Dashboard for DAGs for monitoring and updated in real time whenever a grievance was closed
Redressal	<ul style="list-style-type: none"> • Multiple movement of files between section, coordination, dispatch 	<ul style="list-style-type: none"> • Direct Sectional redressal , with no unnecessary file movement

	<u>OLD SYSTEM</u>	<u>NEW SYSTEM (MODULE) 's IMPACT</u>
Recognition	<ul style="list-style-type: none"> • Multiple points of receipt of Grievances , so no integrated awareness of amount of Grievances 	<ul style="list-style-type: none"> • Single Entry for Feedback and Grievances and unified platform for reporting
Redressal	<ul style="list-style-type: none"> • Timeliness of Grievances and feedback were not able to be followed properly, as each was processed in single physical file . 	<ul style="list-style-type: none"> • Timeline norms which were not existing earlier were made and enabled to be followed (the details given in Graphs)
Reporting	<ul style="list-style-type: none"> • No register of pending grievances and No method of putting information to DAGs or monitoring by DAGs and PAG. 	<ul style="list-style-type: none"> • Dashboard for DAGs for monitoring and updated in real time whenever a grievance was closed
Remedy	<ul style="list-style-type: none"> • Multiple movement of files between section, dispatch and less comprehensive 	<ul style="list-style-type: none"> • Section being aware of the regular nature of shortcomings and grievance it is facing.

Conclusion

Every organisation has a crucial role of grievance redressal mechanism for all its stakeholders. This enhances the learning curve and enables it to focus on sub processes or sections where most of the grievances are emanating from. This is particularly relevant for entitlement based functions, where there is time bound assurance of delivery of services. The IT tools which are available assist the higher management to monitor the

processes and the key performance indicators, as well as assist processing officers to keep a track of the stage in which his grievances are awaited. This can further be matured by providing machine learning algorithms which provide expected time of grievance redressal, like some of the mobile platforms. This can further be used with data analysis for overall assessment as well as the individual employee.

Principal Accountant General (A & E) » Employee » Feedback

All Grievances / Feedback

Feedback No / Mobile No: Select Group :

Sl No	ID / Date	Submitted By	Group /GPF No	Description	Status	Action
1	14235 29-06-2022	Subrata Mitra NA	Provident Fund EDN/WB/20768	Registration of mobile number	Process	<input type="button" value="Action"/> <input type="button" value="Close"/>
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7	14227 20-06-2022	BRAHMANANDA PAL 9474696748	Provident Fund NA	Missing in account slip on 4/2021 (Rs.15000).	Process	<input type="button" value="Action"/> <input type="button" value="Close"/>
8	14226 20-06-2022	ASIMA SANPUJ(HANRA) 9564460327	Provident Fund MISC/WB/35005	login problem	Process	<input type="button" value="Action"/> <input type="button" value="Close"/>
9	14225 18-06-2022	Abhijit Maji 7699775400	Pension JUS/WB/18041	Continue GPF Account	Process	<input type="button" value="Action"/> <input type="button" value="Close"/>

3. Auditing in Marine Ecosystem

Mr. Charles D Selwyn, Data Manager, O/o PAG (Audit-II), Tamil Nadu

The office of Accountant General (Audit-II), Tamil Nadu and Puducherry conducted the Performance Audit on Conservation of Coastal Ecosystems for the period 2015-20. The state of Tamil Nadu has a coastline of 1076 km (15% of the total coastal length of India) and stretches along the Bay of Bengal, the Indian Ocean and the Arabian Sea. Beside the coastal waters, the other major ecosystems found in the coastal environment of the State are Mangroves, Coral reefs, Sea Grass, Mud Flats, Estuaries/backwaters, Lagoons etc., These ecosystems are home to many important and endangered marine animals like Dugong, Sea turtles, dolphins and sharks that depend on Seas and Oceans for their existence. The coastline also supports a huge human population with its rich marine resources. However, increasing human population, urbanization and accelerated developmental activities has put enormous pressure on the thirteen¹ Coastal Districts effecting the fragile marine ecosystems in the State.

In order to conserve and protect coastal stretches and unique marine environment Coastal Regulation Zone (CRZ) notifications have been issued in 2009, 2011 and 2019 by the Ministry of Environment, Forests and

Climate Change (MoEF&CC). CRZ includes the territorial water limits and extends up to 500 meters from High Tide Line (HTL) on the landward side. In case of tidal influenced water bodies, it covers the area between Low Tide Lines (LTL) on both the banks and extends up to 100 meters from HTL on the landward side. To assess and address the environmental impacts of various projects and to regulate and monitor such activities, MoEF&CC also constitutes State Environment Impact Assessment Authority (SEIAA), National Coastal Zone Management Authority (NCZMA) and Tamil Nadu State Coastal Zone Management Authority (TNSCZMA).

As per CRZ Notification, the Coastal Zone Management Maps(CZMP) are prepared by the respective State or the Union Territory Governments and approved by MoEF/GOI. The CZMP in the scale of 1:25000 shall be used by the State level authorities for macro regulation of developmental activities in the coastal areas of the States. PDF copies of the CRZ maps also published in the website of Department of Environment and Forests/GoTN. Local level maps in the scale of 1:3960 or nearer is envisaged for use by local bodies for implementation of CZMPs.

¹ Thiruvallur, Chennai,Kancheepuram,Cuddalore,
Nagapattinam,Thiruvavur,Thanjavur, Pudukkottai,
Ramanathapuram, Thoothukudi, Tirunelveli, Kanniyakumari

Challenges encountered during the audit:

Long coastline and the presence of Gulf of Mannar Biosphere Reserve makes the Tamil Nadu coast, a significant location for endangered species such as Coral Reefs, Sea Grass, Dugong etc. Inspection of long coastal line for violations cannot be ascertained / identified through physical inspection and need utilization of GIS technology. Hence, it was decided to obtain coastal zone maps in PDF format from the department and to analyse the status of implementation of coastal zone management aspects along the Tamil Nadu coastline.

This audit focused on evaluation of the conservation efforts and identifying Coastal Regulation Zone (CRZ) violations in Tamil Nadu. Geo spatial data and technical support from research agencies like ISRO, National Centre for Sustainable Coastal Management etc. was required for identification of CRZ violations and degradation of Coastal ecosystems. The coastal zonation maps were not provided to audit in the required format. Lack of adequate financial resources also hindered getting outside technical expertise in the field.

Utilisation of Spatial data for identification of extent and nature of CRZ violations in the State:

In the absence of spatial data from research organizations and shape files of CRZ maps from the Government, audit undertook the challenge of spatial analysis.

The PDF files of CZMP were converted into TIFF files and superimposed on Google Earth software. Aerial image analysis of the Google Earth historical imagery (with CZMP layer overlaid) was taken up over the period from 2011.

The effective utilization of spatial data helped Audit to identify more than 90 violations in CRZ area throughout the State. Further, many violations were verified through Joint Physical Inspections. This approach also aided in identification of violation of conditions to CRZ clearance by few selected Project proponents as well.

Through the effective utilization of spatial data this office has done an exceptional work of identifying more than 90 violations which could not have been identified through the traditional methodology of Audit. Further, though the necessary spatial imageries of coastal zonation were not made available to audit, Audit undertook the difficult task of converting the available PDF image of CRZ coastal zones of Tamil Nadu and superimposed them with the current coastal maps of Tamil Nadu to identify violations. This work could have been lot easier, if technical agencies had been engaged, however audit did not engage the technical agencies and went ahead with the novel initiative of identifying the violations through the above mentioned methodology. Through this, auditors achieved dual impacts of imparting technical know-how in the field of spatial data analysis to the field parties and at the same time saved the expenditure that could have been incurred for deploying technical agencies.

Outcome of the Audit:

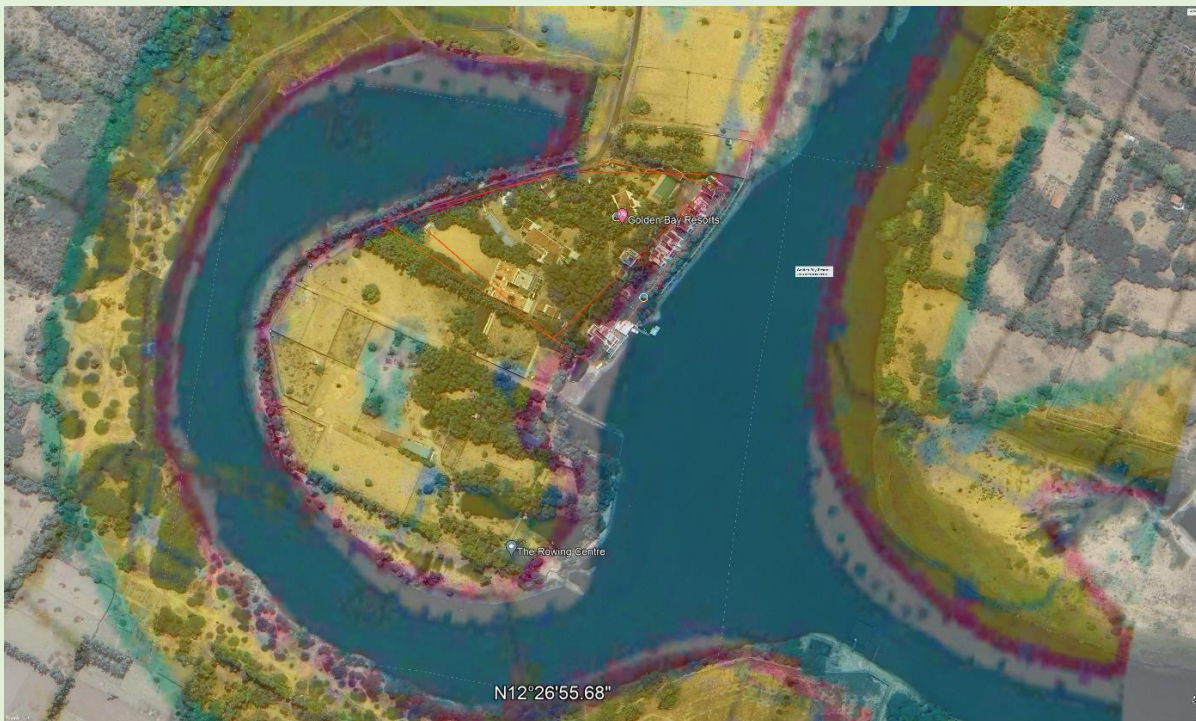
- Audit identified more than 90 Coastal Zone violations with respect to construction and activities in the prohibited zones of the coastal areas.
- Effective Utilisation of audit expertise without any additional expenditure on external expertise.

- Developed in-house skills in spatial analysis

An illustration of utilisation of satellite imageries for identification of violation in CRZ area for corroborating the findings is as follows. The resort had been constructed within the Tidal influenced water body which is a No Development Zone.

Illustration 1

Unauthorized construction of Beach Resort - by M/s. Golden Bay Resorts at Kovathur village, Cheyyur taluk, Chengalpattu District.



The PDF files of CZMP were converted into TIFF files and superimposed on Google Earth software.

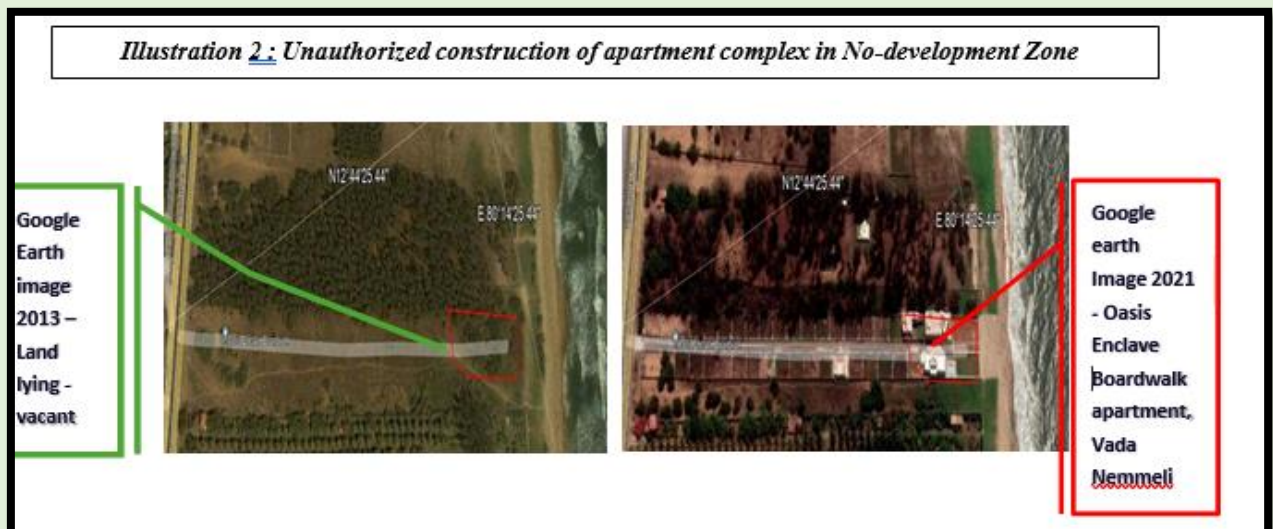
Yellow colour denotes CRZ-III which is No development Zone.

Lat 12°27'6.25"N : long 80° 7'14.18"E



During December 2021 construction of beach resorts were noticed at Kanathur in No Development Zone (CRZ III), Kancheepuram district in Tamil Nadu.

Lat 12°49'59.46"N Long 80°14'51.51"E



4. Trend of IT audits

Mr. Vikash Kumar, Director (Information Systems-II), O/o The C&AG of India, New Delhi

Information technology has been key drivers for functioning of various organization types over last 3-4 decades. We are in an era, where delivering values through Information Technology is no more a luxury. Governments have also joined the IT based transformations. Transformation here includes changes in internal functioning, as well as improving the service delivery mechanism.

Since all the departments are using IT for the service delivery, any assurance-oriented audit would essentially include audit of IT systems also.

DIGITIZATION IN GOVERNMENTS

Digitization journey in every organization (private/ public) have followed its own path. The journey depends on a lot of internal (area of functioning, resources available, governance/ management structure and proactiveness etc) and external factors (regulatory environment, availability of appropriate technology, security concerns, stakeholders' demand etc). The discussion in this section is focused on digitization journey in case on Indian government and its departments. The major phases in digitization of Indian government can be identified as:

1. Early digitization- It involved primarily those departments that rely on a lot of structured data and had a focused objective. Passenger

reservation system in as important example in this regard.

2. Individual initiatives- In 1990's though there has not been significant policy level push for digitization, there were lot of initiatives in various governments and departments. The digitization in this phase included mostly land records management, stamp duty collection, district level service delivery etc. The most significant push form these individual initiatives came in form of IT Act 2000. It basically provided validity to digital transactions.

For these initiatives, the product mostly has been MIS systems to aid management for monitoring and reporting. The initial IT audits have also focused on accuracy and completeness of data in these systems.

3. National e-Governance Plan (NeGP)- It takes a holistic view of e-Governance initiatives across the country, integrating them into a collective vision and a shared cause. It was aimed at making all Government services accessible to the common man in his locality, through common service delivery outlets and ensure efficiency, transparency and reliability of such services at affordable costs to realise the basic needs of the common man. It

comprised of 31 mission mode projects (MMPs) and was launched in 2006.

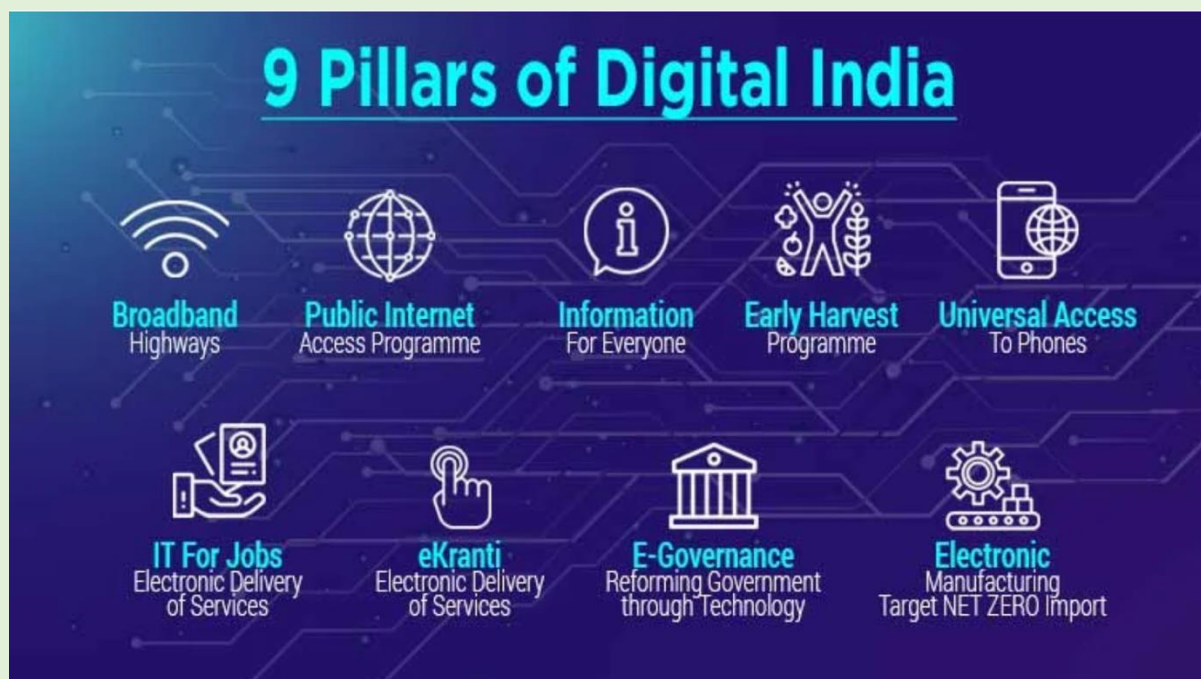
NeGP among other things decentralized the governments for service delivery. Government services were delivered through Common Service Centres (CSCs) and the infrastructure support was provided by State Data Centres (SDCs) and State Wide Area Network (SWAN).

The main concern at this stage has been reach of the government services. Service delivery was decentralised but it was not on demand yet. The IT audits also centered around the onboarding of services, reach and reliability of the services.

4. Digital India Program- Digital India was launched in 2015 to bridge the

gap with service delivery and recipients. It is centred on three key vision areas Digital infrastructure as utility to every citizen, Digital empowerment of citizen and governance and services on demand. With Digital India, the focus is not merely on digitization or service delivery. It goes beyond that to enable citizens to demand services. Merely digitization is not enough for the IT based transformation. With this mission, e Kranti aims at ‘Transforming e-governance for transforming governance’.

Other major reforms that have impacted the e-governance story is development of India Stack that provides a platform for business and citizens to interact, innovate and develop new solution for governance.



IT AUDIT AND E-GOVERNANCE

Audit of IT system aims at providing assurance whether IT investments by any organisation has helped the organisation in achieving the business objectives. IT audits also evaluate the controls for additional risks that digitization adds like information, security, privacy, disaster recovery etc.

The methodology for IT audits have been same over the year and it includes (illustratively):

Review of documentations.

Walkthrough of systems and interview of key professionals.

Data analysis and substantive testing

IT AUDIT IN ERA OF EMERGING TECHNOLOGY:

E-governance has been largely influenced by emerging technologies like artificial intelligence & machine learning (AI/ML), Block chain, Internet of Things (IoT). The infrastructure architecture has changed with usage of cloud infrastructure and services. System development techniques have changed a lot with platform based development. The advent of low-code/ no-code development with agile project management has changed the way systems have been development, documentation is maintained. It posed a lot of challenges to IT audits.

For different changes, the evaluation in terms of effect on governance as well as auditing needs to be done.

AGILE DEVELOPMENT

Agile development is fast replacing the traditional waterfall methodology for software development. Agile methodology makes the user community a participant in the development. In Agile development, the detailed requirements are not framed upfront rather the requirements and system design is discussed on the go. In such a case, conventional documentation (likes FRS/SRS) is not there. There are user stories for customer requirements. Design may change as per requirement. The distinction between development, testing, maintenance and product owner is blurred.

IT audits have usually been relying a lot on system design documentation. Without proper exposure to agile methodology routines, the auditors are at risk of drawing wrong conclusion about functional mapping, availability of system design etc.

Agile methodology provides an opportunity for auditors to provide feedback at early stage with concurrent audits.

LOW CODE/ NO CODE DEVELOPMENT

IT industry have matured to provide solutions for many business problems like ERP (enterprise resource management), BPM (business process management), DMS (document management system), CRM (Client relationship management), BRE (business rule engine etc). These products provide standard solution to business problems. The software development team need not develop the complete system from scratch, rather a customization with low code

can be used to make the product ready for deployment. While it makes the deployment fast, the solution may not always suit the business scenario. In such a case, there is always a need for business process reengineering with digitization.

The audit risk in such a case is selection of appropriate solution for the business problem. The out-of-box solution in many cases is not suitable for the processes/problems in governments. The auditors need to update themselves about the different solution available in market users' past experience with integration of different components etc.

OPERATIONAL TECHNOLOGY- IT, OT AND IoT

Operational technology refers to the technology (hardware and software) used for control of mechanical operations². IT traditionally has been used for processing of information/ data. Industrial control systems, programmable logic controllers (PLCs), SCADA etc are example of uses of OT. IT and OT interactions expose the whole operations to work of internet and associated threat.

IoT uses internet protocols for connection between IT and OT.

IT adds a lot of efficiency and accuracy to the operations, however the security implications are high and this needs strict SoPs to be followed for cybersecurity. In India, Power ministry has come up with protocols for

power sector. Similarly, other sectors also have their own guidance.

For auditors, although analysis of program logic may be beyond scope of IT audits, there is a need to check that all the guidance/ protocols are in place and these are followed.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

The machine learning algorithms have enhanced the data analysis capacities. Machine learning algorithms are used for predictions and decision making. In governments, the decision making affects the population at large and hence the debate would always be there whether the decision making can be left to the parameters determined by machines and if yes, to what extent.

While the AI usage in government is still primitive, a close watch on its development, along with regulatory framework would certainly help drawing the risk profiling.

OTHER CONCERNS OF IT AUDITS

Cloud computing and its effects

Cloud computing has been used extensively in governments. It has commercial as well as technical implications. For security, Indian government has empaneled the cloud service providers. Traditional dedicated data centres were presumably under control of data owners in terms of access, data backups. The

² The examples can be; use of IT of controlling mechanical operations in workshops, power stations, hospitals etc.

³ In Internet of Things (IoT) the connections of IT controls and mechanical activity is exposed over internet.

challenge for auditors is to have same assurance in case of Cloud services.

Mobile computing

In era of m-governance, the reach of digital services has spread. It has added concerns related to user authentication and cyber security at end point devices. Any mobile based services by government needs to be additionally evaluated for these concerns.

CONCLUDING REMARKS

SUGGESTED READING:

1. <https://www.atlassian.com/agile>
2. <https://gca.isa.org/blog/it-ot-convergence-managing-the-cybersecurity-risks>
3. https://www.meity.gov.in/writereaddata/files/InDEA%2020_0%20Report%20Draft%20V6%2024%20Jan%2022_Rev.pdf
4. <https://digitalindia.gov.in/programme-pillars/>

IT systems have undergone several changes and would do so in future also. For IT auditors, the concerns would always be- what do clients want, what are the business priorities, are there unwanted results of digitization, have I identified the solution at right cost and right time?

Not all the technology changes need a response from IT auditors immediately, which gives auditors time to understand the technology, evaluate the impact and assess the risks.



Reference: <https://larrycuban.wordpress.com/2014/11/27/more-cartoons-on-kids-adults-and-technology/>

5. Development of interactive e-Learning Module:

A basic understanding of ADDIE model and an authoring tool (Adobe Captivate)

Mr. Piyush Tiwari, AAO, iCISA Noida

INTRODUCTION:

The term “e-learning” is defined as “anything delivered, enabled, or mediated by electronic technology for explicit purpose of learning”.

The e-learning definition embraces multimedia courses burnt on CD, multimedia presentations, e-books, and lectures in virtual classes, where dispersed participants and lecturers at the same time log in to education server and actively participate in the lecture communicating through video conference, chat or phone.

It shows that e-learning can be a strong and cost-effective alternative to studying in the classroom. The effectiveness of E-learning is marked by its ability to achieve statistically significant effect on improving learners’ knowledge. learners learn more using computer-based instruction in comparison to traditional classroom methods.” One possible factor for this seems to be the increased level of learner participation through interactivity. This results in higher levels of cognitive

engagement and perseverance to complete the task

It is said to improve retention by incorporating many elements such as quizzes,

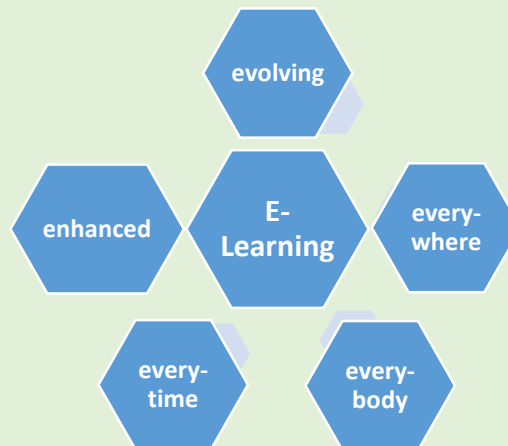
audios, videos, and interactions among others to reinforce the message to the learners.

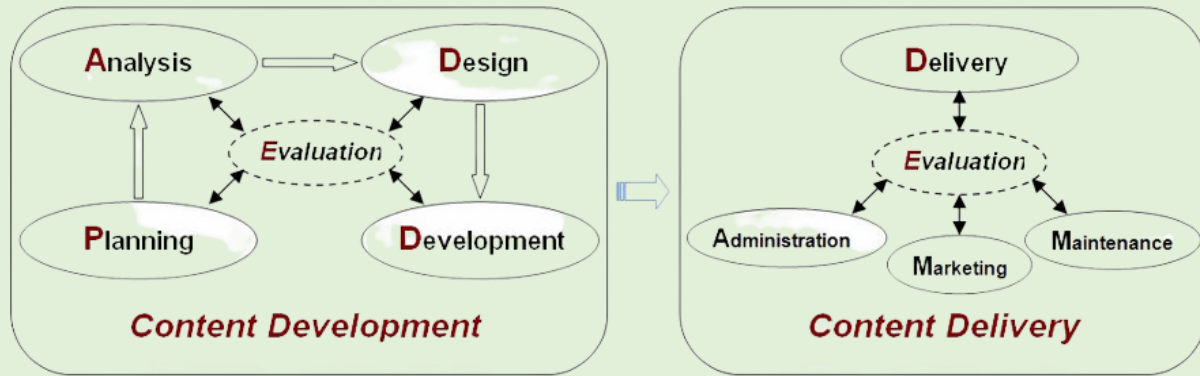
The results indicate that E-learning could be used as a supplement method of teaching to the traditional teaching and hence to improve learning.

ADDIE Model:

ADDIE is the most widely used framework in designing and developing e-learning programs. It stands for Analysis, Design, Develop, Implement and Evaluate.

The ADDIE model is a systematic instructional design model consisting of following 5 steps in developing an e-Learning content:





I. Analysis Phase:

(i) Identification of learning needs and objectives:

It involves understanding the desired outcomes of the e-learning module and alignment with the overall goals of the organisation. A need analysis to be done to evaluate the skills and performance gaps of the target audience.

(ii) Defining learning constraints and resources:

It involves identification of factors such as budget limitations, timeline, software or tools requirements, and availability of subject-matter experts.

(iii) Defining mode of e-learning or instructional strategies:

Determination of instructional methods, delivery formats, interactive elements, question modes and mode of assessment of the modules.

(iv) Development of project plan:

The end stage of analysis phase is the development of a detailed project plan. This plan outlines the scope of the project, timelines and roles and responsibilities of

the team members. It provides a roadmap for the subsequent phases of the ADDIE model.

II. Design Phase:

(i) Content Organisation:

It involves determination of e-learning content structure, creation of logical flow, duration of overall e-learning programme and sequencing of modules. The content organizer ensures that learners can easily navigate through the learning materials and comprehend the subject matter.

(ii) Storyboarding or Prototyping:

Storyboards outline the structure and flow of the learning content, including the visuals, interactions, and assessments. Prototyping involves creating a rough version of the learning experience to test and refine the design before full development.

(iii) Selecting Media and Technologies:

It involves incorporating multimedia elements such as videos, images, audio, or animations. The choice of technology, such as learning management systems (LMS), authoring tools, or virtual reality, is determined based on the needs of the learners and the available resources.

(iv) Discussion with technical team:

The script for e-content is planned in consultation with the media experts and software programmers to decide where graphics and animation to be added, how audio/video clippings to be added in the e-script and how to assess the e-learning material.

III. Development Phase:

(i) Preparation of the script:

The content is aligned with the learning objectives and organized according to the structure outlined in the Design phase. This involves writing instructional text, creating presentations, designing infographics that convey the necessary information to the learners.

(ii) Multimedia Production and Interactive Component Development:

This involves recording and editing videos, creating audio narrations, designing visual assets, or working with multimedia production tools. The interactive components are designed to enhance learner engagement and reinforce learning objectives. This may include creating interactive simulations, scenarios, quizzes, drag and drop, matching, click and reveal interactions.

(iii) Technical implementation:

This may involve using authoring tools, learning management systems (LMS), or other software platforms to create and organize the content. The instructional designer ensures that the learning materials are compatible with the chosen delivery method or platform.

(iv) Iterative Review and Revision:

The instructional designer may collaborate with subject matter experts or project team to gather feedback and make necessary adjustments (editing) to improve the learning materials before finalizing them for implementation.

(v) Details of the e-Learning Module:

After editing the e-script, a manual for the usage of e-Learning Module is to be prepared to help the learners understand the procedures for using e-Learning content.

IV. Implementation Phase

(i) Delivery of e-Learning Module:

The e-Learning Module is to be shared with the target audience by conducting instructor-led training sessions, online webinars, virtual classrooms, or deploying eLearning modules on a learning management system (LMS).

(ii) Feedback and Communication:

It involves establishing channels of communication with the learners to encourage feedback and address any questions or concerns. Feedback can be collected through surveys, discussion forums, email, or other means.

(iii) Monitoring and Progress Tracking:

This may involve tracking learner engagement, completion rates, assessment results, or any other metrics that indicate the effectiveness of the learning experience. Monitoring allows for identifying areas of improvement and providing timely support to learners, if needed.

V. Evaluation Phase

(i) Data collection and analysis:

It involves collection of data and feedback from various sources to evaluate the learning experience by means of surveys, assessments, observations etc. The collected data is helpful in analyzing and to derive meaningful insights. The data analysis helps to understand the impact of the learning experience and informs decision-making for future enhancements.

(ii) Evaluation against Learning Objectives:

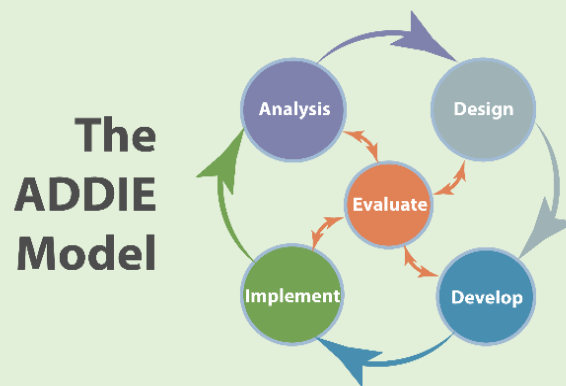
After the completion of e-learning module, an end-module test is designed for complete evaluation of module. The evaluation helps determine if the learning objectives were met and if there is a need for any revisions or adjustments in the instructional design.

(iii) Learner's feedback:

Feedback from stakeholders such as learners, subject matter experts, instructors, and organizational leaders is essential in evaluating the learning experience. It provides a holistic view of the effectiveness of the learning experience and can inform future improvements.

(iv) Documentation and Reporting:

The findings, insights, and recommendations from the evaluation phase are documented and reported. This documentation serves as a record of the evaluation process and provides valuable information for future iterations of the instructional design process. It helps in communicating the outcomes and recommendations to stakeholders and serves as a reference for future design and development cycles.



AUTHORING TOOLS:

To create a proper course for e-learning, an authoring tool is required to facilitate this work. By defining the objects' relationships

to each other, and by sequencing them in an appropriate order, one can produce attractive and useful graphics applications.

E-content has very important features that make the work easier than paper-content which are storing, modification, reusability and sharing of information. To find the authoring tool that works best for you, conduct a needs assessment.

The classification of authoring tools can be based on different aspects such as:

Complexity: the tools can be classified in range from simple to advance. Simple tools support drag and drop facilities, user-friendly, wizard etc. while advance tools require programming capabilities, technical competency etc.

Fees: Free or commercial.

Purpose: useful for creating online courses or not.

There are number of tools available for creating e-learning courses. Here we are discussing one of such authoring tools, i.e. Captivate (developed by Adobe System Incorporated)

What is Adobe Captivate?

Adobe Captivate is a stand-alone multipurpose e-Learning application for creating tutorials, quizzes, assessments, and even simple slide shows; software demonstrations, software simulations and branched scenarios in HTML5 format complex interactive material.

It helps to create and design engaging, responsive, and interactive courses that

increase learners' performance and knowledge retention.

It is compatible for use with other Adobe products.

The Adobe e-learning assets available include:

Fluid Boxes: With a logical flow maintained across devices, objects (like text and graphics) automatically align in accordance with the browser, screen size, or device in use.

Mobile Migration Tools: Instead of having new courses designed from scratch, non-responsive courses are transformed through developer programming to adjust to screens of all sizes.

Typekit Integration: Captivate's Typekit feature allows content authors to create cloud based Typekits for online course fonts, giving the content a consistent appearance on every device.

Responsive Interactions: With Captivate, designers build device-specific control over interactive components in lessons, making said lessons more fun, dynamic, and easier to understand for students, eventually increasing knowledge retention.

Getting Started:

Here are some basic layouts to have an understanding of Adobe Captivate:



I. The Captivate Layout:

Launch the Captivate tool.

This layout consists of different types of projects available in Adobe Captivate.

Fig.1 shows the launch or welcome screen

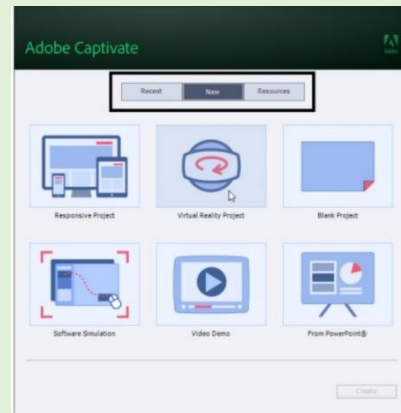
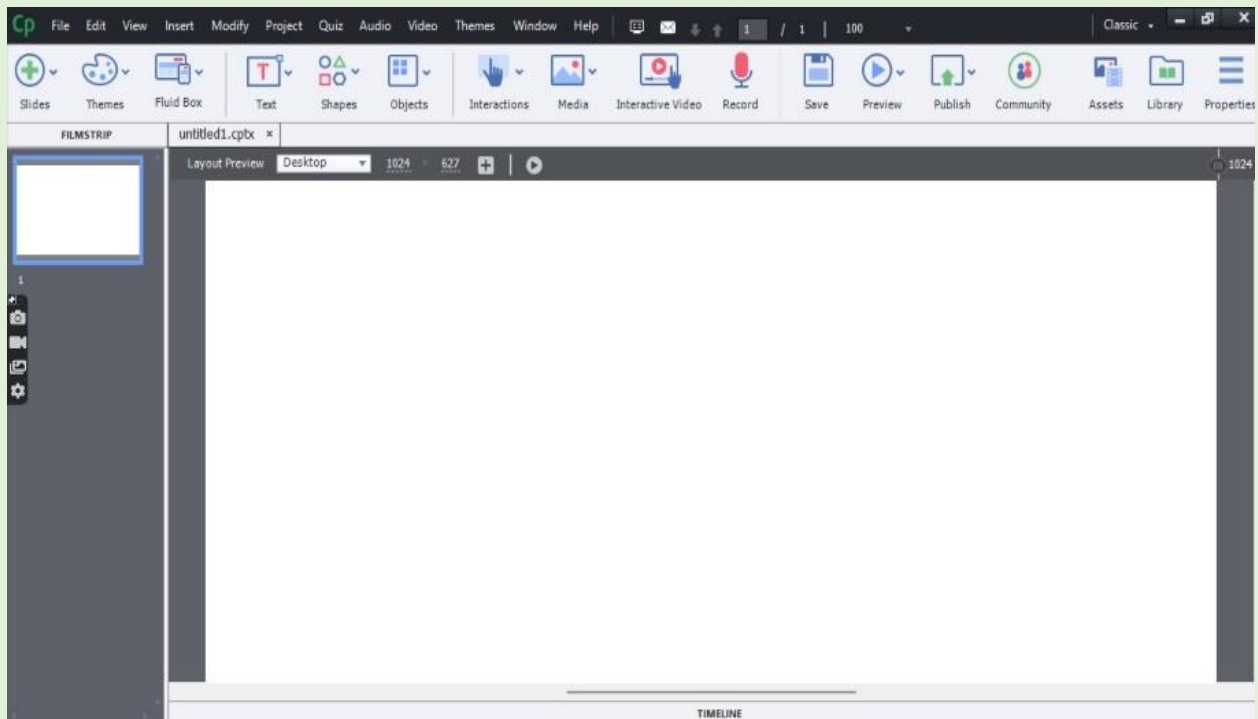


Fig.1: Adobe Captivate Launch screen

II. The Captivate Editing Environment:

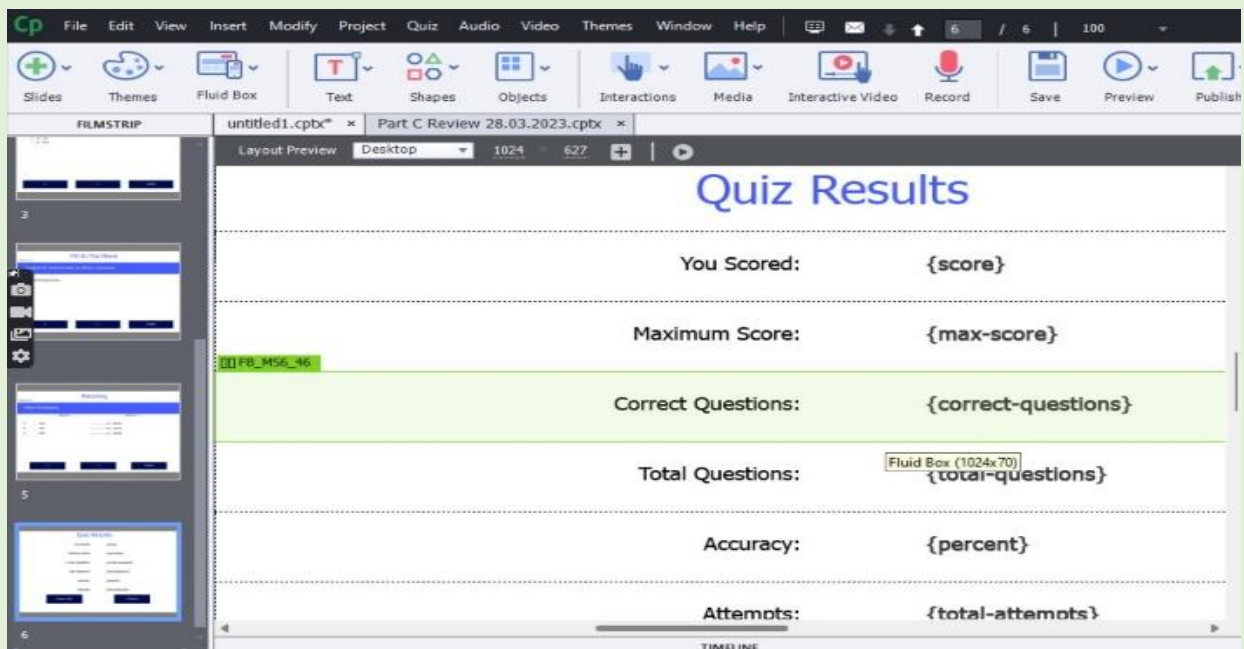
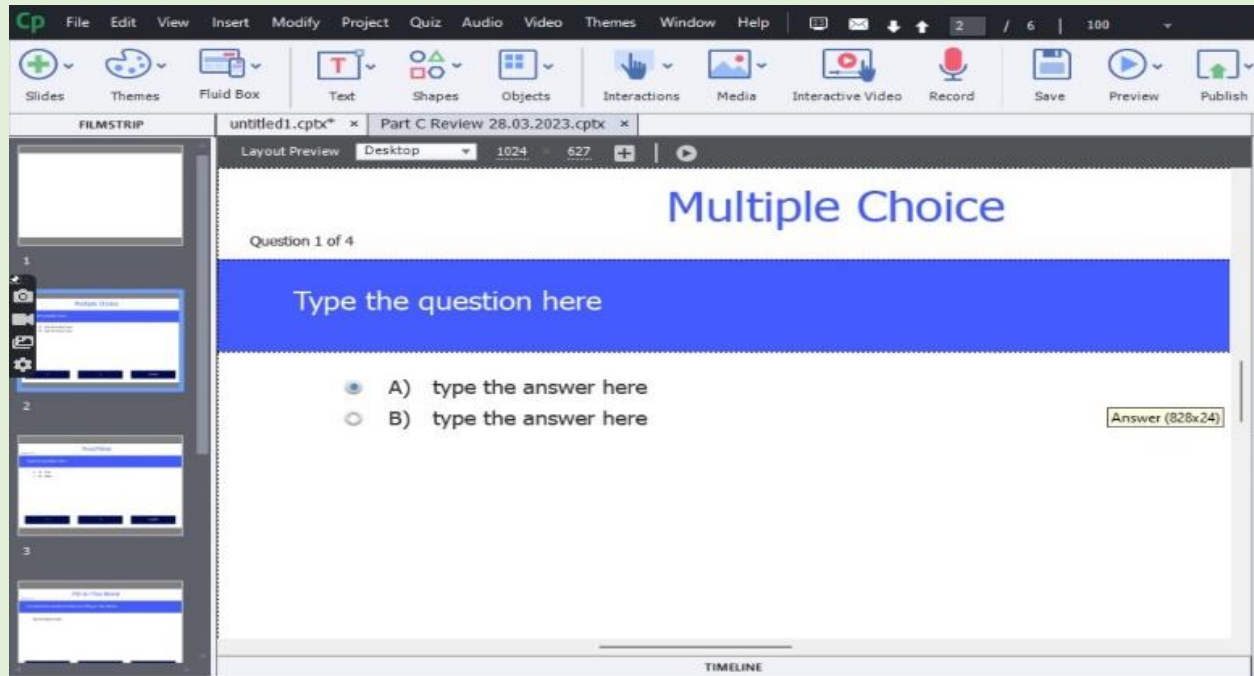
The Captivate editing environment provides various panels, bars, and windows to help in

arranging Captivate slides. The editing environment, also known as the **Workspace**, helps in developing the presentation.



III. Developing Content: It allows us to add, modify text captions, and provide audios (voice-overs, background music, and sound effects), videos, animations, images, hyperlinks, to projects that have been created.

IV. Creating the Quiz: Adobe Captivate is equipped with a quiz making features. There are several types of questions, namely True/False, Multiple Choice, Fill-in-the-Blank, and Matching questions. The types of question can be tailored to the needs of each class.



V. Previewing Your Captivate Project

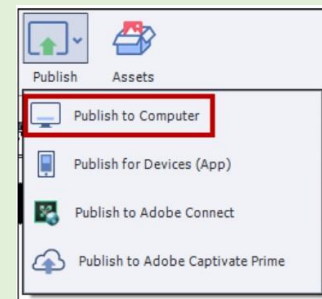
After you edit your Captivate project, you should utilize the preview options to verify the project is ready for publishing.



VI. Publishing Your Captivate Project

When you are finished editing your project, you will need to publish it.

When you publish a project, all of the slides and objects are rendered into a web-friendly format.



VII. Reviews:

Various reviews are being conducted to check that the e-Learning development is on the right track. To begin with, arrange regular meetings amongst the project working team, to ensure a common approach across courses and to agree what content would be covered

in each module. Once the e-Learning module (eLM) drafted, review the eLM from a technical perspective and end users to check its understanding to them and whether it met their needs from a training perspective.

CONCLUSION

e-Learning is an increasingly popular method of delivering training, reducing the need for classroom sessions and allowing users to take courses when they choose. This article has described how off-the-shelf software packages can successfully be used to develop e-Learning content in conjunction with Microsoft PowerPoint. It has also presented some of the key things to consider when developing courses and discussed how to make the content engaging to the user.

Several online resources are available that can help to get started and to understand the e-Learning development through Adobe Captivate, for e.g.

- (i) **Adobe Captivate Tutorials:** provided by Adobe and covers wide range of tutorials and learning resources. These tutorials can be accessed for free.
- (ii) **Adobe eLearning Community:** An online forum to connect with other Captivate users. Users can

raise queries and find helpful tips shared by community members.
 (iii) **Other online courses/trainings/videos etc:**
 There are various online

platforms that offers courses and training on Captivate. Online video tutorials provide structured learning paths to enhance the Captivate skills



Reference: <https://larrycuban.wordpress.com/2014/11/27/more-cartoons-on-kids-adults-and-technology/>

6. App Watch

1. MeriLiFE Mobile Application

MeriLiFE is a mobile app designed to support people in adopting a sustainable lifestyle through pro-environment decisions in their day-to-day activities. Its inspiration stems from the LiFE concept, introduced by the Honourable Prime Minister at COP 26, focusing on conscientious and intentional usage rather than thoughtless and excessive consumption.

The mission is to bring sustainable living within everyone's reach. One can begin his journey toward an eco-friendly lifestyle by downloading our app and taking that initial step towards becoming a PRO-Planet individual.

Link:

<https://play.google.com/store/apps/details?id=com.merilife&hl=en&gl=US>



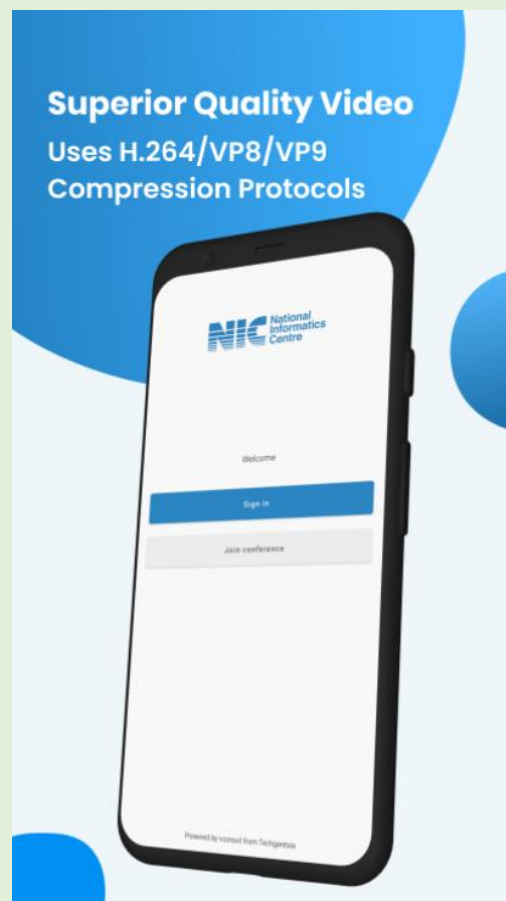
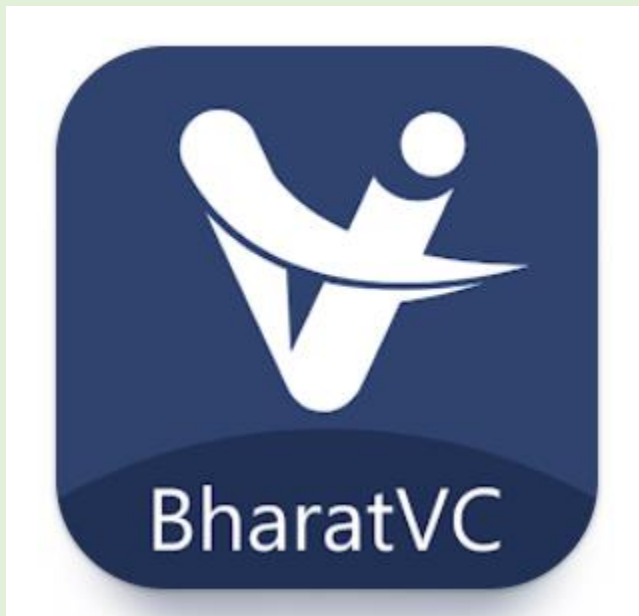
2. BharatVC

BharatVC is hosted on the NIC cloud by the Ministry of Electronics & Information Technology, India, serving as the go-to solution for official video conferencing needs nationwide. This platform enables high-quality video meetings even in low-bandwidth conditions, accommodating over 100 participants. With robust encryption, it ensures safety and security, offering worry-free video conferencing at no cost!

Experience seamless and top-notch video meetings on the move with Vconsol, allowing face-to-face collaboration with your team members in HD audio and video. Simplify your video conferencing and meetings for practical, hassle-free interaction.

Link:

<https://play.google.com/store/apps/details?id=com.vconsol.meity&hl=en&gl=US>



7. Quiz Corner

1. Who introduced the concept of smart contracts and in which decade?

- A) Vitalik Buterin in the 2010s
- B) Nick Szabo in the 1990s
- C) Satoshi Nakamoto in the 2000s
- D) Hal Finney in the 1980s

2. What is the primary advantage of a smart contract when it comes to transactions?

- A) Requires third-party intermediaries
- B) Allows for easy alterations to the code
- C) Immutability of transactions
- D) Secrecy of the contract terms

3. Which vulnerability led to the infamous DAO attack in 2016?

- A) Re-entrancy attack
- B) Time stamp dependence
- C) Gas-related vulnerabilities
- D) Logic errors in specifications

4. Which legislation was cited as needing modifications in India to validate block chain-based transactions?

- A) IT Act 2000
- B) Indian Evidence Act
- C) Digital Signature Act

D) Block Chain Transaction Act

5. What is the main advantage of incorporating smart audit procedures into smart contracts?

- A) Reduced need for external auditors
- B) Enhanced secrecy of audit procedures
- C) Autonomous execution based on if-then logic
- D) Exclusively manual code analysis

6. What does Grievance Redressal refer to?

- A) Addressing and resolving complaints within an organization
- B) Acknowledging positive feedback from stakeholders
- C) Implementing IT solutions for service delivery
- D) Creating new protocols for employee recognition

7. What is the role of the Grievance Node Officers (GNO) in the office's system?

- A) Initiating grievance recognition protocols
- B) Designing IT solutions for grievance redressal
- C) Creating dedicated email IDs for grievance processing

D) Acting as single-point redressal officers within functional groups

8. How did the office improve grievance redressal efficiency using technology?

A) By implementing machine learning algorithms

B) Through the creation of multiple grievance recognition systems

C) By reducing offline redressal time to a fraction using an online module

D) By setting up separate channels for email grievances

9. What was the average reduction in redressal time observed between offline and online grievance redressal in a sample of 15 cases?

A) Reduced from 15 days to 7 days

B) Reduced from 23.26 days to 4.6 days

C) Reduced from 10 days to 2 days

D) Reduced from 30 days to 10 days

10. What is the significance of integrating various types of grievance mechanisms?

A) Creates complexity in the redressal process

B) Provides time-based monitoring and analysis

C) Limits the scope for understanding recurrent grievances

D) Reduces the need for hierarchical monitoring

11. What were the major phases identified in the digitization journey of the Indian government?

A) Early digitization, National IT Act, Digital India

B) Initial initiatives, NeGP, Digital India Program

C) Early digitization, Individual initiatives, National e-Governance Plan (NeGP), Digital India Program

D) National IT Act, Individual initiatives, Digital India Program

12. What was the focus of the National e-Governance Plan (NeGP) launched in 2006?

A) Centralizing government services

B) Making all government services accessible through mobile apps

C) Decentralizing government services through Common Service Centres (CSCs)

D) Enhancing cybersecurity for government databases

13. What is the core focus of the Digital India Program launched in 2015?

A) Digitizing government records

B) Providing free Wi-Fi across the country

C) Enabling citizens to demand services and governance on demand

D) Creating new digital infrastructure for government offices

14. What challenges do auditors face in the era of Agile development?

- A) Insufficient documentation and blurred roles in development teams
- B) Slow development pace and lack of user involvement
- C) Limited access to technology and inadequate resources
- D) Overemphasis on documentation and rigid role definitions

15. What technology poses security concerns due to the interaction between IT and OT (Operational Technology)?

- A) Artificial Intelligence
- B) Cloud Computing
- C) Internet of Things (IoT)
- D) Mobile Computing

16. What does the ADDIE model stand for in the context of designing e-Learning content?

- A) Analyze, Design, Develop, Integrate, Evaluate
- B) Adapt, Develop, Discuss, Implement, Execute
- C) Analyze, Develop, Deploy, Implement, Evaluate
- D) Analysis, Design, Develop, Implement, Evaluate

17. Which phase of the ADDIE model involves determining instructional

methods, interactive elements, and modes of assessment for e-learning modules?

- A) Analysis Phase
- B) Design Phase
- C) Development Phase
- D) Implementation Phase

18. What is the purpose of the "Multimedia Production and Interactive Component Development" phase within the Development Phase of the ADDIE model?

- A) Writing instructional text and organizing content
- B) Designing the project plan and outlining project scope
- C) Creating rough versions of the learning experience to refine design
- D) Recording videos, designing visual assets, and creating interactive elements

19. What is Adobe Captivate used for in e-Learning development?

- A) It is a presentation software for offline slideshows.
- B) It creates basic HTML websites for online courses.
- C) It develops interactive e-Learning content, simulations, and branched scenarios.
- D) It provides cloud storage for e-Learning modules.

20. Which feature of Adobe Captivate helps maintain a logical flow of content across devices by automatically aligning objects based on the screen size?

- A) Fluid Boxes
- B) Mobile Migration Tools
- C) Typekit Integration
- D) Responsive Interactions

21. What are some key considerations when developing e-Learning content, as mentioned in the conclusion?

- A) Creating complex multimedia interactions
- B) Reducing user engagement through surveys

C) Utilizing off-the-shelf software packages like PowerPoint

D) Limiting access to online resources for e-Learning development

Answer		
1-B	8- C	15- C
2-C	9-B	16-D
3-A	10-B	17-B
4- A	11-C	18-D
5- C	12- C	19-C
6- A	13- C	20-A
7-D	14- A	21-C



Reference: <https://larrycuban.wordpress.com/2014/11/27/more-cartoons-on-kids-adults-and-technology/>