A Report on

Impact Assessment of PDMS

Plan, Dig and Monitor System (PDMS) of GNCTD

Submitted to

Department of Information Technology
Government of NCT of Delhi
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-Digital India Team at IIPA

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List of Abbreviations Used

Sr. No.	Abbreviations	Details
1.	API	Application Programming Interface
2.	APP	Application
3.	BPR	Business Process Reengineering
4.	BRPL	BSES Rajdhani Power Limited
5.	BYPL	BSES Yamuna Power Limited
6.	CEO	Chief Executive Officer
7.	CM	Chief Minister
8.	C-DAC	Centre for Development of Advanced Computing
9.	DeGS	Delhi e-Governance Society
10.	DJB	Delhi *Jal* Board
11.	DIP	Digital India Programme
12.	DSSDI	Delhi State Spatial Data Infrastructure
13.	DST	Department of Science & Technology
14.	EDMC	East Delhi Municipal Corporation
15.	EE	Executive Engineer
16.	EPIC	Explicitly Parallel Instruction Computing
17.	e-Gov	Electronic Governance
18.	EOI	Expression of Interest
19.	GIS	Geographic Information System
20.	GoI	Government of India
21.	G2G	Government to Government
22.	G2C	Government to Citizen
23.	G2B	Government to Business
24.	GNCTD	Government of National Capital Territory of Delhi
25.	GSDL	Geospatial Delhi Limited
26.	HR	Human Resource
27.	HTTP	Hypertext Transfer Protocol
28.	ICT	Information Communication Technology
29.	ID	Identity Document
30.	IP	Internet Protocol
31.	IGL	Indraprastha Gas Limited
32.	IIPA	Indian Institute of Public Administration
33.	IPR	Intellectual Property Rights
34.	ISO	International Organization for Standardization
35.	IIS	Internet Information Services
36.	IT	Information Technology
37.	MB	Mega Byte
38.	MCD	Municipal Corporation of Delhi
39.	MTNL	Mahanagar Telephone Nigam Limited
40.	MeitY	Ministry of Information & Technology

41.	NCT	National Capital Territory
42.	NDMC	New Delhi Municipal Council
43.	NeGD	National e-Governance Division
44.	NeGP	National e-Governance Plan
45.	NHAI	National Highway Authority of India
46.	NIC	National Informatics Centre
47.	NGO	Non-Governmental Organization
48.	NRSA	National Remote Sensing Agency
49.	OGC	Open Geospatial Consortium
50.	OTP	One Time Password
51.	PDF	Portable Document Format
52.	PDMS	Planning Digging and Monitoring System
53.	PPP	Public Private Partnership
54.	PWD	Public Works Department
55.	RCA	Road Cutting Agency
56.	REST	Representational State Transfer
57.	ROA	Road Owning Agency
58.	ROW	Right of Way
59.	SBI	State Bank of India
60.	SDMC	South Delhi Municipal Corporation
61.	SLA	Service Level Agreement
62.	SOAP	Simple Object Access Protocol
63.	SMS	Small Message Service
64.	SSL	Secure Sockets Layer
65.	SWOT	Strengths, Weakness, Opportunities, Threats
66.	TEOS	Technical, Economic, Operational/ Organizational, Social
67.	TB	Tera Byte
68.	TPDDL	Tata Power Delhi Distribution Limited
69.	URL	Uniform Resource Locator
70.	US	United States
71.	UT	Union Territories

Glossary of Terms

S. No.	Abbreviation	Description
A		
	API	In computer programming, an application-programming interface (API) is a set of subroutine definitions, protocols, and tools for building application software. In general terms, it is a set of clearly defined methods of communication between various software components.
	ASP.NET	ASP.NET is an open-source server-side web application framework designed for web development to produce dynamic web pages. It was developed by Microsoft to allow programmers to build dynamic web sites, web applications, and web services.
B		
	Broadband	Broadband is a popular term used for high-speed computer network or Internet access technology for wide bandwidth data transmission with an ability to simultaneously transport multiple signals and traffic types. In simpler words, it means faster digital communication for audio, video, text, graphics etc. Broadband connectivity requires upgrading transmission medium from conventional transmission cables (coaxial cable, twisted pair copper cables) may be optical-fiber cables or to wireless broadband options.
	Bandwidth	Bandwidth is also defined as the amount of data that can be transmitted in a fixed amount of time. For digital devices, the bandwidth is usually expressed in bits per second (bps) or bytes per second. For analog devices, the bandwidth is expressed in cycles per second, or Hertz (Hz).
C		
	C-DAC	The Centre for Development of Advanced Computing is an Autonomous Scientific Society of Department of Electronics and Information Technology, Ministry of Communications and Information Technology, Government of India.
D		
	Dashboard	Dashboards often provide at-a-glance views of KPIs (key performance indicators) relevant to a particular objective or business process. In the other, "dashboard" has another name for "progress report" or "report".
	MCD	The Municipal Corporation of Delhi is a municipal corporation, an autonomous body that governs 8 of the 11 Districts of Delhi, in the state of Delhi, India.
	DeGS	Delhi e-Governance Society (DeGS) aims to administer the implementation or e-Governance projects for the overall benefit of the citizens and public by setting up the necessary administrative, financial, legal, and technical framework implementation mechanism and resources in the National

		Capital Territory of Delhi.
	3D	Three-dimensional model that displays a picture or item in a form that appears to be physically present with a designated structure. Essentially, it allows items that appeared flat to the human eye to be display in a form that allows for various dimensions to be represented.
	DSSDI	Delhi State Spatial Data Infrastructure (DSSDI) for GNCTD has been initiated by Survey of India (SOI) as a 3D GIS solution including generation of large-scale base map from the aerial photographs obtained in 2007 to cover the state of National Capital Territory of Delhi in an area of about 1500 sq kms.
E		
	EPIC	EPIC (Explicitly Parallel Instruction Computing) is a 64-bit microprocessor instruction set, jointly defined and designed by Hewlett Packard and Intel, that provides up to 128 general and floating point unit registers and uses speculative loading, predication, and explicit parallelism to accomplish its computing tasks.
G		
	G2B	G2B is digital exchange of information, service, & product between Governments to Businesses.
	GSDL	Geospatial Delhi Limited is a Geo-Knowledge enterprise of GNCT of Delhi assumes the role of custodian of Spatial Data Infrastructure (SDI) created under DSSDI project. GSDL maintains and updates spatial data through mapping & surveys and facilitates its usage by departments of Delhi.
	GIS	Geographical Information System (GIS) is a computerized technology that uses a geographic information system as a framework for managing and integrating data. GIS is often associated with maps.
	G2G	G2G is a type of digital exchange of information, service, & product between Governments to Government.
	Grievance	A real or imagined cause for complaint by the citizens especially for unfair treatment.
H		
	HTTP	The Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative, and hypermedia information systems.[1] HTTP is the foundation of data communication for the World Wide Web.
	Hard Disk	A hard disk is part of a unit, often called a "disk drive ”“,hard drive," or "hard disk drive," that stores and provides relatively quick access to large amounts of data on an electromagnetically charged surface or set of surfaces. Today's computers typically come with a hard disk that contains several billion bytes (gigabytes) of storage.
I		
	Information Communicati	ICT, or information and communications technology (or technologies), is the infrastructure and components that

	on Technologies (ICTs)	enable unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage
	IIS Server	Internet Information Services (IIS) is a flexible, general-purpose web server from Microsoft that runs on Windows systems to serve requested HTML pages or files.
	ISO	The International Organization for Standardization (ISO) is an international standard-setting body composed of representatives from various national standards organizations.
	IP	An Internet Protocol address (IP address) is a numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication. An IP address serves two principal functions: host or network interface identification and location addressing.
J		
	Java Script	JavaScript ("JS" for short) is a full-fledged dynamic programming language that, when applied to an HTML document, can provide dynamic interactivity on websites.
N		
	NCT	The Union Cabinet, while deciding to give full statehood to Delhi, has also resolved to carve out a "National Capital Territory" (NCT). The NCT will be the seat of the Government of India, house the cream of the Indian establishment and be directly controlled by the Union Home Ministry.
	NRSA	National Remote Sensing Centre (NRSC) is a full-fledged centers of ISRO. NRSC was functioning as an autonomous body called National Remote Sensing Agency (NRSA) under Department of Space (DOS) until August 2008. The Centre is responsible for remote sensing satellite data acquisition and processing, data dissemination, aerial remote sensing and decision support for disaster management.
O		
	OGC	The Open Geospatial Consortium (OGC), an international voluntary consensus standards organization, originated in 1994.
P		
	Payment Gateway	A payment gateway is a merchant service provided by an e-commerce application service provider that authorizes credit card or direct payments processing for e-businesses, online retailers, bricks and clicks, or traditional brick and mortar.
	PostgreSQL	PostgreSQL (pronounced "post-gress-Q-L") is an open source relational database management system (DBMS) developed by a worldwide team of volunteers. PostgreSQL is not controlled by any corporation or other private entity and the source code is available free of charge.
S		
	Social Media	Social media are computer-mediated technologies that facilitate the creation and sharing of information, ideas, career

		interests, and other forms of expression via virtual communities and networks.
	SSL	SSL (Secure Sockets Layer) is the standard security technology for establishing an encrypted link between a web server and a browser. This link ensures that all data passed between the web server and browsers remain private and integral.
	Silverlight Application	Microsoft Silverlight (or simply Silverlight) is a deprecated application framework for writing and running rich Internet applications, similar to Adobe Flash. A plug-in for Silverlight is still available for some browsers.
	SMS API	SMS API (Application Programming Interface) is means by which the functions of bulk SMSs can be facilitated to another computer program on various devices for sending alerts and notifications.
T		
	TEOS	TEOS is an acronym in project management used to define four areas of feasibility of the project. T – Technical, E – Economic, O – Operational/Organizational, S – Social
U		
	UTs	Union Territory is an administrative division in India ruled directly by the Union Government.
	URL	A Uniform Resource Locator (URL), colloquially termed a web address, is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it.

Executive Summary

India being one of the developing countries has taken a lead in digital economy with its flagship programme 'Digital India' in a bid to provide transparency, accountability and by facilitating information availability for accurate decision-making (Magno and Serafica, 2001)[1]. Several States/Union Territories have also put their efforts for creating a conducive governance ecosystem by implementing technology trends in several of its critical systems. In the same vein, initiated by a cabinet note date June 06, 2016 Government of NCT of Delhi (GNCTD) launched its online permission portal for road cutting and road owning agencies in National Capital Territory that was flagged off for usage in November 2016.

About PDMS

This portal (www.gsdl.org.in/pdms) has been aptly titled 'Plan, Dig and Monitor System' (hereinafter being referred to as 'PDMS' or 'System) and has been indigenously designed and developed by Delhi e-Governance Society (DeGS) and Geospatial Delhi Limited (GSDL). This is expected to be first of its kind of portal that uses high-resolution GIS map, online cutting/ digging permissions process and online payment with MIS data to support decision making of client agencies as well as the management agencies.

Systems Before online implementation of PDMS

Before the implementation of PDMS, the road cutting agencies sought from the respective road owning agencies the desired approvals. Even the details of work such as the cost and time involved were all estimated manually. The process understandably involved lot of paper work and time, and multiple visits to the concerned departments and all steps were infested with related concerns. Even loss of data and files were constantly bemoaned by the respective agencies, to the disadvantage of each other.

After online implementation of PDMS

Online portal of PDMS made a rightful claim of streamlining this entire process, right from applying for a new road-cutting request, to provision of a high resolution GIS map of the road patch to be dug followed by inspection request with utility owners, e-payment and up to its online approval till the completion of the job. Further, the system maintains to have not just shortened the turn-around time of the permission process but also claims to have ushered in transparency in the entire process. The system also avers to have uniquely blended its MIS of the process with related high-resolution GIS maps on commendable scale of 1:2000, which is still if not absent but still rare to sight in other e-government initiatives of the state/country.

[1] Magno, F. A. and Serafica, R. B. (2001). Information technology for good governance. Manila: Yuchengco

Need for Impact Assessment Study

Indian Institute of Public Administration (IIPA), New Delhi, was entrusted to undertake impact analysis of PDMS portal and to validate if scope and objectives of PDMS outlined at the time of its inception have been achieved; if achieved, then to what extent and if not, then what may be proposed as remedial strategy.

Aim and Objectives of the Study

The proposed study aims to assess the overall impact created by PDMS and to suggest a way forward that makes it more effective and efficient in its delivery and operability. To achieve this aim, the objectives of the study have been identified as:

- To review the existing system: genesis, mission, vision, objectives, and core functionalities of the portal.
- To understand and compare PDMS with similar initiatives in the country.
- To delineate and apply a conceptual framework of impact assessment parameters for evaluating the usefulness of PDMS.
- To propose recommendations for sustaining PDMS in a more standardised and responsive manner.

Methodology Undertaken

The proposed study had been conducted in two phases *viz.* the review (Phase-I) and detailed research analysis (Phase-II).

First phase: The Review Phase of the Study- The first phase included an overview of the existing portal as an outsider, then from the macro-perspective of road cutting and road owning agencies, including management and citizens. In this phase a basic comparison was also done with similar initiatives prevalent elsewhere in the country, including the ones in Andhra Pradesh, Telangana, Tamil Nadu and Karnataka. For preliminary study, these initiatives were studied on context and nature of services, delivery, usage of GIS and about nature of ultimate user of the system through portal observation techniques and hence this phase was deemed the 'Review Phase' of the study.

Second phase: The Survey Phase of the Study - After understanding the system from the perspective of a casual user, it was deemed important to take rightful beneficiary agencies' opinion on the same. For doing so, in the second phase of the study a primary research analysis of PDMS was undertaken using survey techniques. Therefore, the second phase of the study was deemed the 'Survey phase'.

A. *The Research Tools Used* - An assessment framework has been formulated based on the preliminary study comprising of SWOT (Strengths, Weakness, Opportunities and Threats) analysis and TEOS (Technical, Economic, Operational/Organizational and Social) metrics.

   The varied attributes of TEOS that were measured using the survey-tool included:

- Technical (comprehensive portal analysis, content/services delivered, service delivery channels, Electronic payment gateways, Technical support available, Compliance to GIGW).

- Economic (existing revenue model, G2G communication and internal transfer pricing, Hidden Expenses - *if any*).

- Operational/Organizational (functioning of the eco-system, organizational structure, Team allocation, Extent of services, Feedback/ escalation mechanisms).

- Social (societal impact of the system, behavioral changes of crucial actors/stakeholders of the system).

The system was evaluated using these TEOS attributes, to detail its SWOT (Strengths, Weaknesses, Opportunities and Threats) as well as to identify future prospects of its enhancements.

Further, a comparison was also done on the usage parameters of the portal as on date and as compared with the numbers within six months of its inception including number of registered users, active users, number of applications received and applications processed.

B. Sample Used - The study exercised a convenience sampling method to obtain responses from users of PDMS. The idea was to represent PDMS users in a non-discriminatory manner. Further, even though the PDMS portal has three kinds of users - Road Cutting Agencies (RCA), Road Owning Agencies (ROA) and Citizens, the first one, viz. RCA constitutes the most important end-user of the portal, therefore the sample composition also tilted in favour of RCA representation which was noted 70% of the total respondents. The total constituents of the survey through round table were thirty-one in number, only twenty-six responded back with the entire completed tool.

C. Survey Methods Used

- At the outset, at special behest of the team, the basic understanding of the portal as well as the ice breaking activity of the IT team of the department was accomplished through *a detailed technical presentation of the PDMS system* by the designer-team to the research-team, wherein portal access from all possible log-ins was demonstrated.

- Since face-to-face (f2f) interviews can be very effective, therefore the information from *leaders of the department / IT team was captured through F2F interviews*. This ensured that the research team receive in-depth answers to all the queries.

- *Surveys*, helped to capture the main data by undertaking a *round table consultation* with audience comprising of all the stakeholders of the portal (ROAs, RCAs, GNCTD senior IT management, portal designers from GSDL and DeGS, citizens and research team of PDMS)

- This was followed by *open-ended discussions* in the round table format to elicit un-tethered opinion of the stakeholders in a semi-structured manner. Certain clarifications were sought and explanations/ experiences shared.

- Last but not the least, to glean exclusive stakeholders' concerns, specific to each *user-subgroups within* ROAs and RCAs, close-knitted interactions were carried out in focus groups.

D. Steps Used

a. Basic portal information was gathered through technical presentation.

b. After this step, a macro review of content was done by the team itself, to evaluate the strengths and weaknesses of the portal, both from the perspective of ROAs, RCAs as well as a casual visitor to the portal.

c. These two steps (step a. and step b.) had fully empowered the team and armed with complete technical and operational information, a semi-structured face-to-face interviews were undertaken with senior IT officials of GNCTD as well as with designer of the portal to decipher the driving force, vision, and related aspects of its genesis and operation.

d. After the research team was very thorough with management perspective as well as with the technical and operational intricacies of the portal, a round table stakeholders' consultation meet was organised with thirty-one constituents representing all the sub-groups of stakeholders.

e. The TEOS based tool was provided to these thirty-one constituents of the sample in three modes – online (a URL was provided where the tool was uploaded *https://admin.isavvy.in/vanity/iipa*), offline mode (a *.doc* file) and a printout version of the same. Based on their comfort level, the respondents could opt for any and then the team collected filled version of all the three formats.

f. The information, hence collected was further refined by conducting smaller closed group focus discussions with a subset of participants belonging to the same agency to capture their specific experiences with the portal.

g. The entire data (numbers, perceptions, remarks, discussions, experiences and explanations), hence collected was cleaned and validated using appropriate mechanisms by cross-referencing with the system documents, manuals and the designer team.

h. The cleaned and validated numerical data was represented graphically using MS-Excel to present a coherent analysis on various aspects of TEOS (stated above).

i. The subjective remarks and experiences captured through the survey tool, focus group discussions and round table deliberations, were broadly categorised by the researchers' team in TEOS.

j. The system was evaluated using these TEOS attributes as well as content analysis of the remarks/discussions/experiences to detail its SWOT (Strengths, Weaknesses, Opportunities and Threats) as well as to identify future prospects of its enhancements.

k. After the detailed analysis of the data obtained from the two phases of the study were filtered for accuracy and brevity and was put forth in the report.

E. Organization of the Report - This report is an outcome and an overview of the results attained through the review (phase-I) and primary research analysis

(phase-II) undertaken in the study. A birds' eye-view of the same is represented herein:

Chapter One is the 'Introduction to the Study'. It presents the need and background of the study and further gives scope of work along with an overview of the methodology undertaken to pursue the proposed impact assessment study.

Chapter Two focuses on the 'Overview of PDMS'. This chapter covers the need, genesis, scope of services and work flow of PDMS.

Chapter Three 'Review of Existing System' delineates the outputs achieved from implementing portal-observation techniques from the macro-perspective of primarily ROAs and RCAs and then management and citizens too. It provides the output of these findings in the conceptual framework constituting TEOS attributes including GIGW compliance of PDMS. This elaboration is followed by SWOT analysis of the system as well as comparative table of difference in features from similar national practices including the ones being implemented in the states of Telangana, Tamil Nadu, Karnataka and Andhra Pradesh.

Chapter Four is the 'Research Analysis of PDMS'. It covers the output of the primary research analysis of PDMS gleaned through survey technique in phase-II of the proposed study. Critical TEOS based attributes of the system has been analysed through a strenuous data collection tool. The output of 'Stakeholders' consultations, undertaken through detailed meetings, round table, interviews have been also been summed up in the chapter.

Chapter Five is on "Conclusive Remarks". This chapter integrates all the findings gleaned through review and primary research of the system. Based on these observations and analysis of consultation rounds several relevant recommendations have been put forth for strengthening important facets of PDMS including its operational, technical and organizational functions.

Summary of Findings

Phase I: Review of Existing System

- **Use of high quality GIS Maps:** PDMS has succeeded in utilising the GIS 3D Maps with aspect ratio 1:2000, which has made the system unique in itself.

- **Speedy Processing of Requests:** PDMS has drastically reduced time taken for road digging permission process, measured in days, on an average from 270 days[2] (taken in erstwhile manual version) to 16 days (after PDMS implementation) leading to almost 94% improvement in processing time.

- **Increased number of Users and Processed Requests:** Use of PDMS by road cutting agencies has observed an increase of almost 200% ever since its inception in November 2016 till now; as vouched by the analytics- in first six months of its launch the number of registered users were 78 and number of processed-requests were 830. In the next six months the number of registered users became 222 (as against 78) and number of processed-requests became 1960 (as against 830).

[2] A primary study conducted on PDMS by DeGS

- **GIGW Compliance:** PDMS has *moderately complied* with Guidelines for Indian Government Websites (GIGW) given by NIC.

- **Fully Online Service Delivery:** PDMS offers fully online end to end service delivery which includes e-payment as well. However, there is no physical delivery centre for its services, albeit of little consequence considering the nature of services being offered by PDMS in its existing version.

- PDMS has achieved the efficacy in commercial aspects in operations by **standardising the fee structure** for road cutting requests and adding the feature of ease of online payment.

- The **comparative analysis with other states**, offering similar services reveals PDMS to be a unique service delivery platform in several ways. PDMS presumably is bringing in complete transparency, accountability and standardization in the processes of the entire value chain (unlike Karnataka's portal that is providing only citizens' interface). Even the user friendlessness provided by PDMS portal has not been sighted in other online portals (for instance, Tamil Nadu offers tougher navigation to its reports), the latter probably being still at nascent stages.

Phase II: Primary Research Analysis

- **GIS Maps:** Focus group discussion revealed that GIS map utility in PDMS has fetched the most appreciation for its online processing.
- **Ease of Use, Design and Interface:** The analysis shows that more than 65% of the respondents found PDMS quite easy in usage with its design and interface.
- **Security and Data Protection:** More than half the respondents considered the PDMS system to be secure and safe for operations over manual system which was data/file/ records loss prone.
- **Online Payment through SBI's Payment Gateway:** For online payment provision, almost 80% of the respondents have taken it as one of the positive reformations of the system.
- **Operational Accuracy and Efficiency:** The percentage of respondents choosing PDMS for providing better operability over manual system is observed to be more than 70%.
- **Feedback, Grievance and Access to Information:** Majority of respondents (more than 65%) were satisfied greatly with the online feedback, grievances and accessing PDMS status information through its dashboard.

Though PDMS has thrived to attain its purpose by offering accountable, transparent agile service delivery; perhaps, it also fetches a scope for further enhancement and requires attention on following observations:

- **Emergency Requests:** PDMS may also add the provision for emergency requests to be catered on priority basis.
- **Cancellation and Refund Policy:** PDMS fails to extend the 'Cancellation and Refund Policy' for road cutting requests by respective agencies.

- **Operational Concerns:** On operational aspect, demarcation of exact and accurate location on GIS maps is sometimes a concern of inappropriate request for processing faced by road cutting agencies.
- **Communication and alerts:** Intra-nodal communication i.e. procedural and operational communication between the related agencies (developers, road owning, road cutting) can be strengthened further in order to curtail the communication interstices.

Recommendations and Way Forward

- **Enhanced GIS Maps:** GIS maps should enable the precise selection in narrow regions along with an added layer with location names on the map.
- **Advanced Payment Interfaces:** Other payment interfaces and gateways can also be integrated to smoothen the online payment provisions; which would also help in generating more prompt updates of transactions.
- **Proactive Support:** Proactive operational and technical support would also make the entire experience friendlier by the users.
- **Capacity Building**: Though GNCTD is already undertaking trainings however, further customised capsules of change management and capacity building' programmes can be undertaken by GNCTD periodically to further empower the stakeholders of the system.
- **Prompt Alert System:** A prompt alert system can be deployed to strengthen the system communication between all the acting stakeholders.
- **Replication:** Replication of the system for other government bodies can also be encouraged.
- **Dynamic Dashboard:** In order to bring the ease of understanding of the system for citizens, a dynamic dashboard of PDMS can be incorporated with graphics and use of user-friendly filters and graphs.
- **Enterprise Architecture:** PDMS in its prospective policy can enable 'Enterprise Architecture' through high level process mapping within the governing agencies.
- **Promotion and Awareness:** PDMS can be publicized in innovative manners being a unique initiative of e-governance.
- **Collaboration:** Other road owning agencies in the territory of GNCTD (e.g. DDA, DSIIDC, and NHAI) could also be approached for getting connected with PDMS, subject to their respective administrative constraints. Though it is more of an administrative suggestion, nevertheless if implemented, it could help the ultimate users of PDMS.

Summarising, one can safely state that through prudent amalgamation of MIS and GIS provisions, PDMS has already successfully achieved several characteristics of good governance including transparency, accountability and efficiency in varied aspects of road digging and road cutting. However, as is true for

any other initiative, there is ample scope of improvement. In future, with endowment of enhanced resources and tweaking of its technical and organizational aspects, PDMS can surely become more versatile.

1. Introduction to the Study

Chapter Overview

First chapter of the report delineates the background to the present study, starting with need for such study (Section 1.1) followed by scope of work with aim and objectives of study (Section 1.2). Subsequent section depicts the stages of study undertaken. It has detailed the methodology of study with its two phases 'Review of Existing System' and 'Primary Research Analysis' (Section 1.3) and the various parameters of the assessment framework for the study (Section 1.4) that will serve as a guiding template for the conduct of the study.

1.1 Need for Study

Since its inception in the year 2016, PDMS has been serving a niche sector of governance through its online portal. After successful completion of one year, PDMS is coming up as an accountable and transparent service delivery platform which stands itself a distinctive initiative with the usage of GIS 3D multi-layered maps for accuracy. Undertaking the impact assessment of this initiative aims to comprehend:

i. The extent to which PDMS has fulfilled its intended purpose.

ii. The extent to which the result obtained corresponds to the resources used.

iii. To have a real sense of ground realities in terms of accessibility, ease of usage, level of engagement, process reforms, standardisation of processes and financial terms across stakeholders.

This study is expected not just to gauge the extent to which PDMS has fulfilled its intended purpose but also would help to encourage and enhance the scope and perspective of PDMS by:

i. Serving as a one-stop solution to cater to all anticipated stakeholders as well.

ii. Extending support for multiple service delivery channel

iii. Undertaking innovative promotional and awareness campaigns

iv. Possible efforts to make the system robust and highly secure

v. Encouraging stakeholders for active involvement through ground-breaking feedback loops and participatory activities.

vi. Setting up a unit for periodical evaluation and monitoring system for customized performance indicators

vii. Enabling a holistic approach with all inclusive process mapping by following an enterprise architecture

1.2 Scope of Work

IIPA was nominated by Department of Information Technology, Government of NCT of Delhi to conduct this impact assessment study. The selection of method to be adopted for any study is dependent on both - the nature of the study and the social phenomena to be probed.

1.2.1 Aim & Objectives

The proposed study aims to assess the overall impact created by PDMS and to suggest a way forward that makes it more effective and efficient in its delivery and operability. To achieve this aim, the objectives of the study have been identified as:

1. To review the existing system: genesis, mission, vision, objectives, and core functionalities of the portal.
2. To understand and compare PDMS with similar initiatives in the country.
3. To delineate and apply a conceptual framework of impact assessment parameters for evaluating the usefulness of PDMS.
4. To propose recommendations for sustaining PDMS in a more standardised and responsive manner.

1.3 Stages of Impact Assessment Study

The course of the study was segregated into four stages, each stage specifically identified through its deliverable *viz. Inception Report* in Stage-I, Development of Data Matrix and *Assessment Framework* to be delivered in Stage-II, *Draft Report* in Stage-III and *Final Report on Impact Assessment of PDMS* in the last stage, Stage -VI (Table 1).

Deliverable wise stages of the Study

Table 1: Deliverables and respective timelines of the Study

Sr. No.	Deliverables
1.	*Stage I* Inception Report
2.	*Stage II* Development of Data Matrix/ Assessment Framework, Collection of Secondary Data Interviews/ Round Table with Stakeholder
3.	*Stage III* First Draft Report
4.	*Stage IV* Final Report with recommendations

- The deliverable of the first stage *viz.* ***Inception report in Stage-I*** was developed after preliminary study and a macro level analysis of PDMS. This report articulates the broad aspects for appraisal of the existing implementation schema of PDMS and presents a suggestive list of parameters of the assessment to be undertaken through primary and secondary data analysis. On basis of this report, the way forward for the study was suggested.
- The second stage of the study, ***Stage-II,*** was based on detailed preliminary study was undertaken to delineate in detail the aim, objectives and methodology to be followed for undertaking the study.

- Further, to move on to ***Stage-III,*** the study had been conducted in two phases *viz.* the review (Phase-I) and detailed research analysis (Phase-II).

First phase: The Review Phase of the Study- The first phase included an overview of the existing portal as an outsider, then from the macro-perspective of road cutting and road owning agencies, including management and citizens. In this phase a basic comparison was also done with similar initiatives prevalent elsewhere in the country, including the ones in Andhra Pradesh, Telangana, Tamil Nadu and Karnataka. For preliminary study, these initiatives were studied on context and nature of services, delivery, usage of GIS and about nature of ultimate user of the system through portal observation techniques and hence this phase was deemed the 'Review Phase' of the study.

Second phase: The Survey Phase of the Study - After understanding the system from the perspective of a casual user, it was deemed important to take rightful beneficiary agencies' opinion on the same. For doing so, in the second phase of the study a primary research analysis of PDMS was undertaken using survey techniques. Therefore, the second phase of the study was deemed the 'Survey phase'.

The Research Tools Used - An assessment framework has been formulated based on the preliminary study comprising of SWOT (Strengths, Weakness, Opportunities and Threats) analysis and TEOS (Technical, Economic, Operational/Organizational and Social) metrics.

The varied attributes of TEOS that were measured using the survey-tool included:

- Technical (comprehensive portal analysis, content/services delivered, service delivery channels, Electronic payment gateways, Technical support available, Compliance to GIGW).

- Economic (existing revenue model, G2G communication and internal transfer pricing, Cost benefits and e-payment attributes, Hidden Expenses - *if any*).

- Operational/Organizational (functioning of the eco-system, organizational structure, Team allocation, Extent of services, Feedback/ escalation mechanisms).

- Social (societal impact of the system, behavioral changes of crucial actors/stakeholders of the system).

The system was evaluated using these TEOS attributes, to detail its SWOT (Strengths, Weaknesses, Opportunities and Threats) as well as to identify future prospects of its enhancements.
Further, a comparison was also done on the usage parameters of the portal as on date and as compared with the numbers within six months of its inception including number of registered users, active users, number of applications received and applications processed.

Sample Used - The study exercised a convenience sampling method to obtain responses from users of PDMS. The idea was to represent PDMS users in a non-

discriminatory manner. Further, even though the PDMS portal has three kinds of users - Road Cutting Agencies (RCA), Road Owning Agencies (ROA) and Citizens, the first one, viz. RCA constitutes the most important end-user of the portal, therefore the sample composition also tilted in favour of RCA representation which was noted 70% of the total respondents. The total constituents of the survey through round table were thirty-one in number, only twenty-six responded back with the entire completed tool.

Survey Methods Used

- At the outset, at special behest of the team, the basic understanding of the portal as well as the ice breaking activity of the IT team of the department was accomplished through *a detailed technical presentation of the PDMS system* by the designer-team to the research-team, wherein portal access from all possible log-ins was demonstrated.

- Since face-to-face (f2f) interviews can be very effective, therefore the information from *leaders of the department / IT team was captured through F2F interviews*. This ensured that the research team receive in-depth answers to all the queries.

- *Surveys*, helped to capture the main data by undertaking a *round table consultation* with audience comprising of all the stakeholders of the portal (ROAs, RCAs, GNCTD senior IT management, portal designers from GSDL and DeGS, citizens and research team of PDMS)

- This was followed by *open-ended discussions* in the round table format to elicit un-tethered opinion of the stakeholders in a semi-structured manner. Certain clarifications were sought and explanations/ experiences shared.

- Last but not the least, to glean exclusive stakeholders' concerns, specific to each *user-subgroups within* ROAs and RCAs, close-knitted interactions were carried out in focus groups.

- The ***Stage IV*** was the consolidated output of all the above mentioned phases. Here, all the data drawn from the review of system (Figure 2) and primary research were collated. The observations and inferences drawn from the studies were complied with future prospects and aspirations, as presented in the Chapter 4 of this report.
- The study was able to formulate the final report on impact assessment of PDMS. The report is extensive in its reach and intensive in its context, deriving the strengths and crucial insights into this niche service delivery platform.

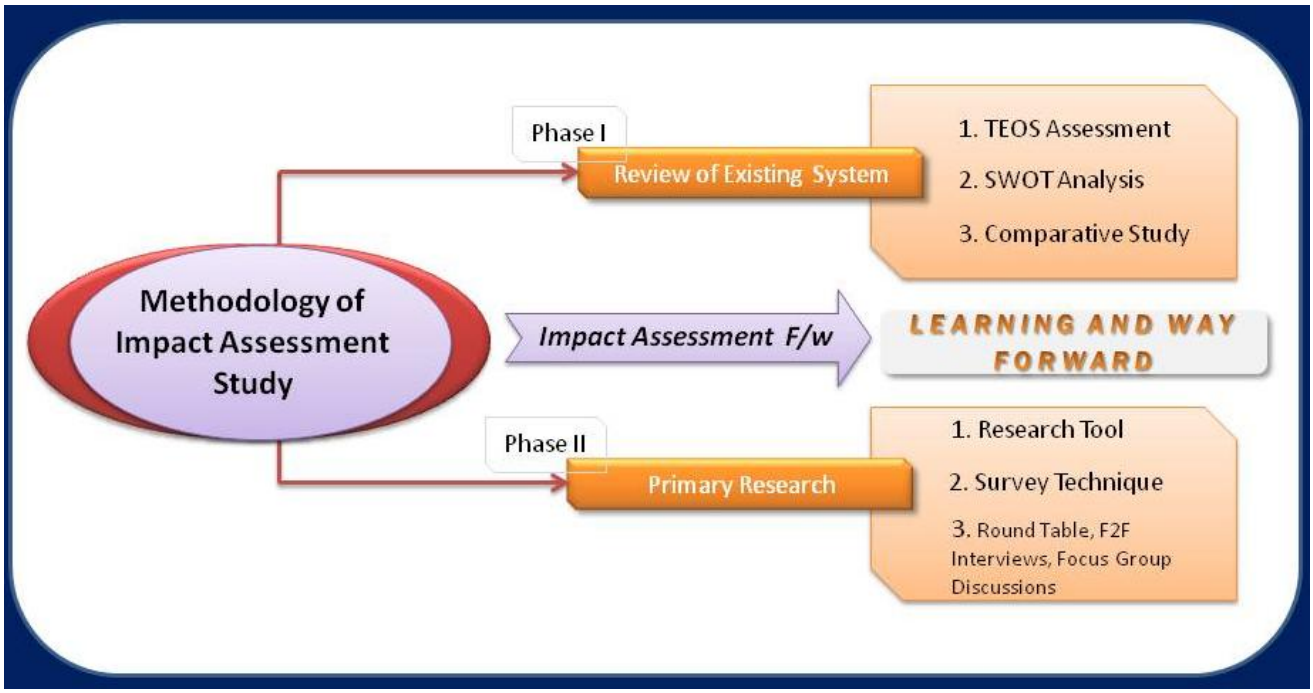


Figure 1: Methodology undertaken for the study
(Source: IIPA Primary Findings)

The inferences and insights drawn from these analyses are proposed for integration with the present institutional structure of PDMS for its enhanced functionality.

The assessment study based on TEOS parameters provides the definition of feasibility, suitability and acceptability of the system in Technical, Economic, Operational/Organizational and Social aspects. Such assessment study has helped in recognizing system aspects which are flawed without advancing any reformations and efforts into them. A detailed SWOT (a tool delineating the strengths, weakness, opportunities and threats for an organization) analysis on TEOS parameters has also been undertaken. These critical insights provide a sound basis to elaborate and propose scope of improvement for PDMS.

1.4 Defining the Assessment Framework

To ensure a holistic approach encompassing the effective practices in electronic service delivery in such a niche sector of governance, IIPA has customized an assessment framework for PDMS portal. The framework contains TEOS based assessment of PDMS, detailed SWOT analysis, Primary Research analysis of the system and a comparative study with similar practices (Figure 2).

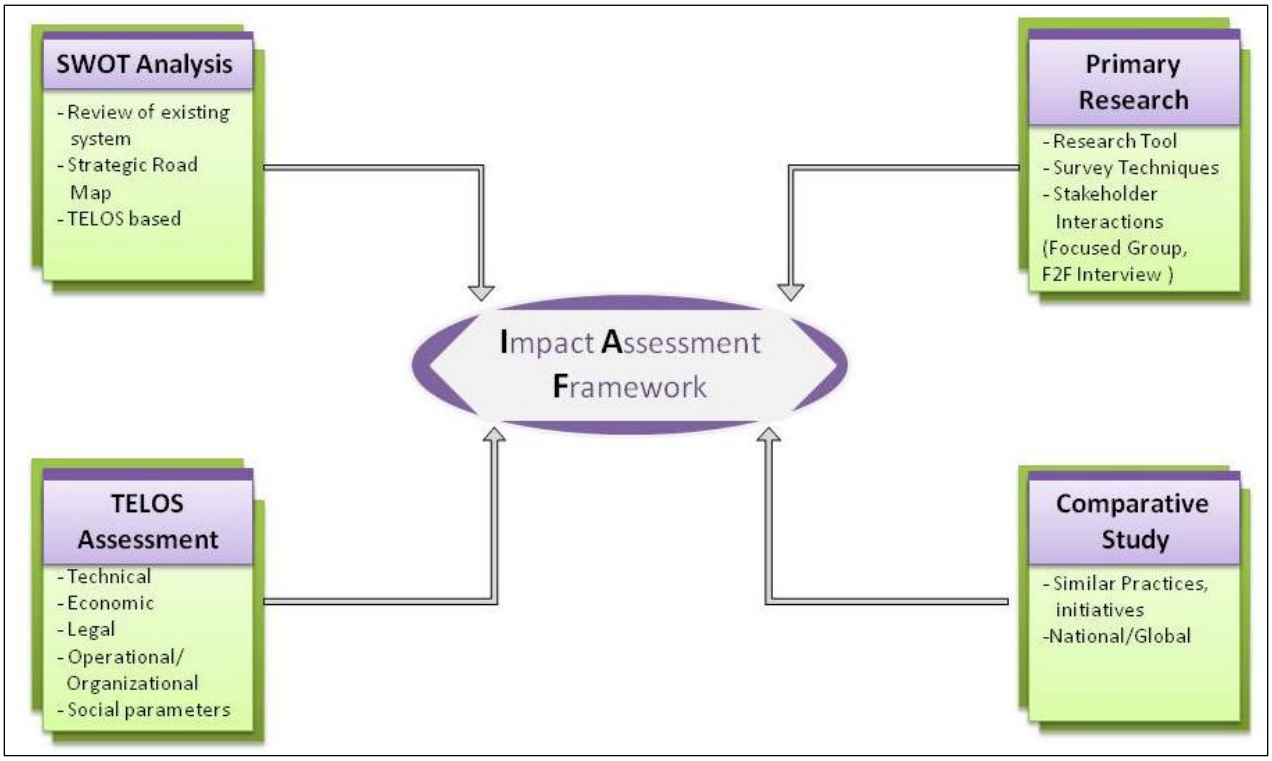


Figure 2: Impact Assessment Framework for PDMS
(Source: IIPA Primary Findings)

In depth assessment study follows the parameters based on Technical, Economic, Operational/Organizational and Social aspects to analyze the impact of the PDMS portal. All these parameters are elaborated to develop a specific understanding with respect to PDMS (Table 2).

Table 2: Suggested Parameters for Assessment

Parameters for Assessment
Technical
- Comprehensive portal analysis (Analysis of configuration required, process/ data flow, content/services delivered including Service Delivery Channels such as Web, Mobile etc.) 1. Technical dependencies (Developers, Designers) 2. Technical Support available (Manuals, resident engineer/team, call-centre, help-line, third party) 3. Electronic Payment Gateways 4. Compliance to GIGW- Guidelines to Indian Government Websites
Economic
1. Study of existing revenue model 2. Guidelines for G2G communication and internal transfer pricing, if any 3. Hidden Expenses *(if any)*
Operational/ Organizational
1. Existing organizational structure 2. Governance Structure /Team allocated

3. Extent of services/ support offered 4. Other related services/ utilities offered by the org 5. Feedback/ Escalation mechanisms for the system 6. Security / Quality Audits 7. Any Certifications to the Organization
Social
1. Study of Behavioral Change of crucial actors/stakeholders of the system 2. Any Societal Impact Assessment 3. Techniques to enhance the outreach - Online and offline

(Source: IIPA Findings)

Summary

This chapter has collated all the decisive aspects of the study. The need for the existing study has imparted a clear rationale to the efforts behind carrying out this impact assessment. Further, the methodology has defined the plan of action to be deployed while undertaking this study. The methodology is further explained in its phases and defined assessment framework for the study. All the subsequent chapters follow the approach which has been laid out by this methodology. Further, Chapter 2 delineates PDMS in its core form giving an overall understanding of the system.

2. Overview of PDMS

Chapter Overview

Before analytically reviewing PDMS, it was pertinent to first have a macro synopsis of the initiative so that the evolution of activities could be understood from the perception of its designers and implementing team. Therefore, detailed investigations were carried out in the preliminary phase of the study, using data collection methods including the presentations, technical discussions, site-observation, reference to their technical and user literature, internal public-domain documents, extensive detailed discussions with the PDMS team including its Program Manager. Based on this study of secondary sources and related investigations, this chapter offers an overview of PDMS's chronological growth and the related gamut of activities that it is presently involved with. The chapter therefore, presents – need, genesis and growth, the various online activities a user can undertake online on www.gsdl.org.in/pdms including register, apply, status update, payments, approvals, Surveys, view dashboards, feedback, suggestions and complaints. Finally, a summary is provided as a snapshot of the chapter.

2.1. Need of PDMS

Large scale infrastructure growth in different verticals like Energy, Power, Telecom, Real Estate, Water etc. has fuelled the need for a technology solution over the manual one for road cutting and digging permissions. Road cutting and digging is required in large numbers as the development and maintenance needs increased immensely. Manual system was clogged with too many problems and there were too many complaints and media outburst for the same. Road owning agencies were taking too much time in providing the permissions. People were making numerous rounds to get the clearances done. There was no transparency in the permission process. Utility maps were not used and there was no visibility of cutting areas and lengths on the map. Files were getting lost. Payment system was not standardized and uniform in its structure. Different agencies were charging different rates from the road cutting agencies. There were traffic congestions and accidents because of the lack of information availability and coordination. Road cutting and digging projects were having time and cost overrun because of delay.

2.2. Genesis and Growth of PDMS

A meeting was held in CM office of Govt. of NCT of Delhi with the IT Department to understand the problems of road cutting and digging permissions and a strategy was devised to simplify the process. In pursuance of Cabinet decision taken in June 2016 with the cabinet note *vide dated* 06.06.2016 for processing all requests for road cutting/digging for getting permissions online through an integrated platform, the PWD of Government of Delhi and SBI signed an MoU in presence of the Chief Secretary, Govt. of NCT of Delhi. Geospatial Delhi Limited (GSDL) and Delhi e-Governance Society (DeGS) were given the responsibility to design and develop a web based application which will bring together the two major stake holders i.e. Road Cutting Agencies like MTNL, IGL, BRPL, TPDDL & DJB etc and Road Owning Agencies like PWD, New Delhi Municipal Council and the three Municipal Corporations onto a single online platform. The applicants can now log on to www.gsdl.org.in/pdms and

apply online. Software was designed as per the functional requirement of road cutting/digging agencies and road owning agencies. After testing the system, the concerned agencies were sensitized. Software application was integrated with SBI e-payment gateway to facilitate online payments.

Advantages of PDMS were outlined at its inception:

1. A uniform charge @ Rs. 3500/- per sq. mt for the restoration of road after the services are laid has been fixed.
2. Permission will be granted online within stipulated period after submission of application.
3. Inspection to be carried out by the concerned agencies within three days of receipt of application.
4. Payment will be made online through SBI Payment Gateway.
5. Online information will be available to the Road Cutting and Road Owning Agencies in a transparent manner.
6. GIS 3D Mapping is used to demarcate the accurate area online for digging and further generating the demand note accordingly.

Various hurdles faced in the implementation of the Plan, Dig and Monitor (PDM) system were sorted out in the Chief Secretary (GNCTD) level meetings held from time to time.

Online Payment Facility

PWD, GNCTD and State Bank joined hands for launching SBI e-pay services (covering internet Banking facility of 42 Banks) for applicants of Road cutting agencies, for applying and paying the requisite fee online to PWD, Delhi Govt. which will be further transferred to concerned land owning agencies.

The software was developed in-house after consulting stakeholders. There is no lock-in with any vendor. The software application can be tweaked easily as and when required. There was some resistance to change amongst road-owning agencies initially. After the decision of the Council of Ministers, meetings of stakeholder agencies were convened to iron out implementation issues. GSDL and DeGS designed a user manual of the application and it was also distributed to the users for ease of understanding of the process. This user manual can also be found there on PDMS portal as well.

2.3. Activities on PDMS (Scope of Services)

PDMS offers a simple array of dedicated activities to be performed online. The GIS based PDM Application is hosted on URL http://gsdl.org.in/pdms (Figure 3). The stake holders can refer to the user manual which is also available on the website.

Various aspects of operations to be performed on PDMS are listed below:

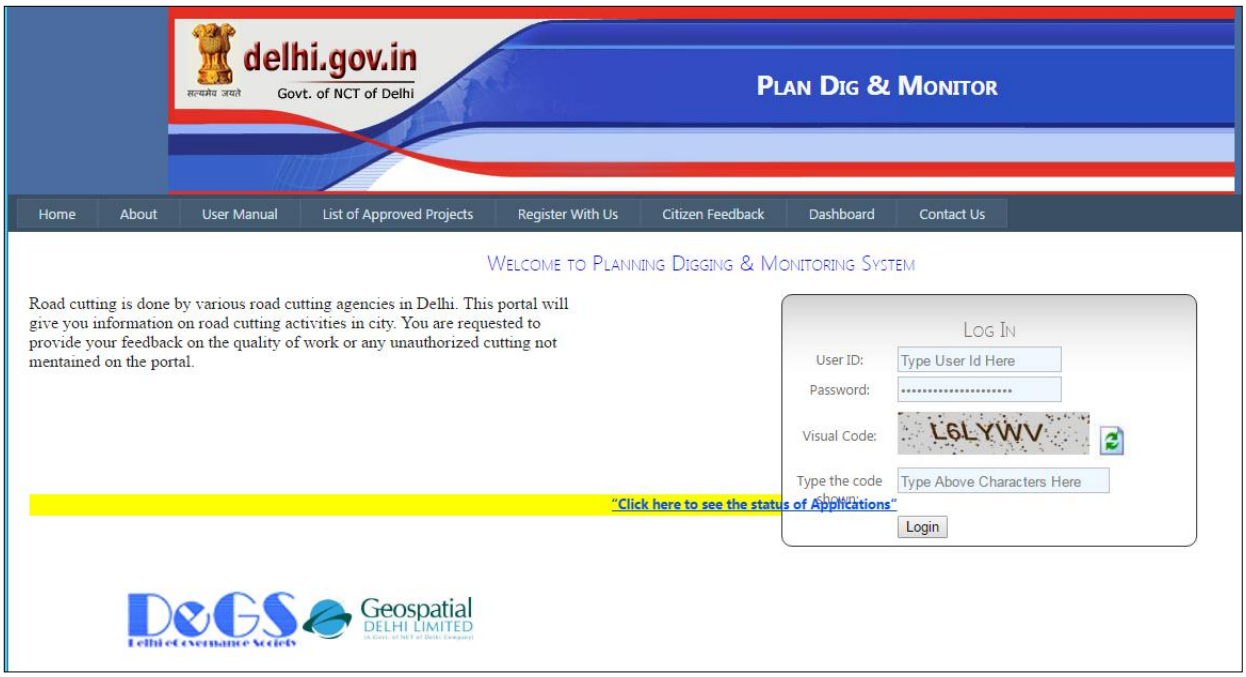


Figure 3: Snapshot of PDMS Home Screen
(Source: http://gsdl.org.in/pdms/, accessed on Jan 15, 2018)

- The software application enables the Nodal Officer of the road digging agency to log into the website and mark the road of the concerned road owning agency on the map which needs to be cut/ dig.
- The length of the road to be cut is calculated automatically by the system and displayed.
- The applicant can mark for different kinds of road cutting namely; trench, trenchless and composite.
- The request of the applicant is automatically transferred to the concerned engineer of the road owning agency along with a PDF file containing the map of the location where road is proposed to be cut.
- A Unique ID is generated, which can be used for future references by all stakeholders.
- The date of site inspection is fixed through the system by the authorised person of the road owning agency and all stakeholders including utility owners.
- Traffic Police are automatically informed through email so that they can be present at the inspection site.
- Once the Competent Officer clears the digging operation after inspection, payment of fee is made by the applicant through an online payment gateway mechanism.
- Thereafter, permission is generated online through the system.

PDMS workflow can also be understood in simple way with help of process flow in the following figure (Figure 4).

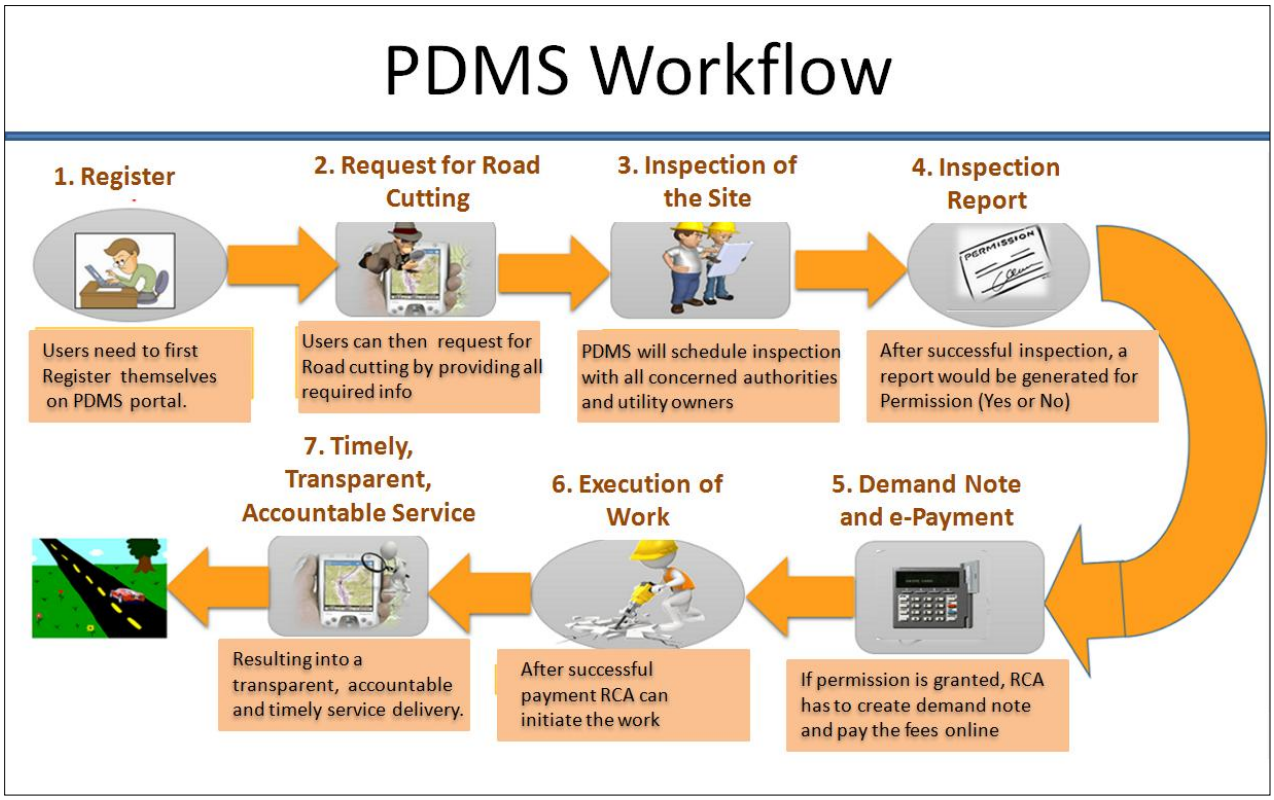


Figure 4: PDMS Workflow

(Source: IIPA Findings)

Citizens can access and see information related to (a) project and location, (b) road digging agency, (c) road owning (permission granting) agency (d) start date, (e) end date and (f) GIS based map of the location.

PDMS has also enabled citizens to (a) give feedback online and (b) upload image in respect of each project (c) register grievances. The citizens can submit their feedback anytime including after the restoration work has been carried out by the Road Owning Agencies.

PDMS Dashboard – Data Analytics

PDMS offers an informative dashboard which gives the information related to road digging requests and their status. Users and citizens can access this dashboard to see information such as (Figure 5) -

- Road owning agencies like PWD, South-MCD, East-MCD, North-MCD
- Divisions of Road Owning Agencies
- Ongoing road digging projects and related details
- Total applications received
- Pending application
- Payment details
- Approved cases
- Projects Completed etc.

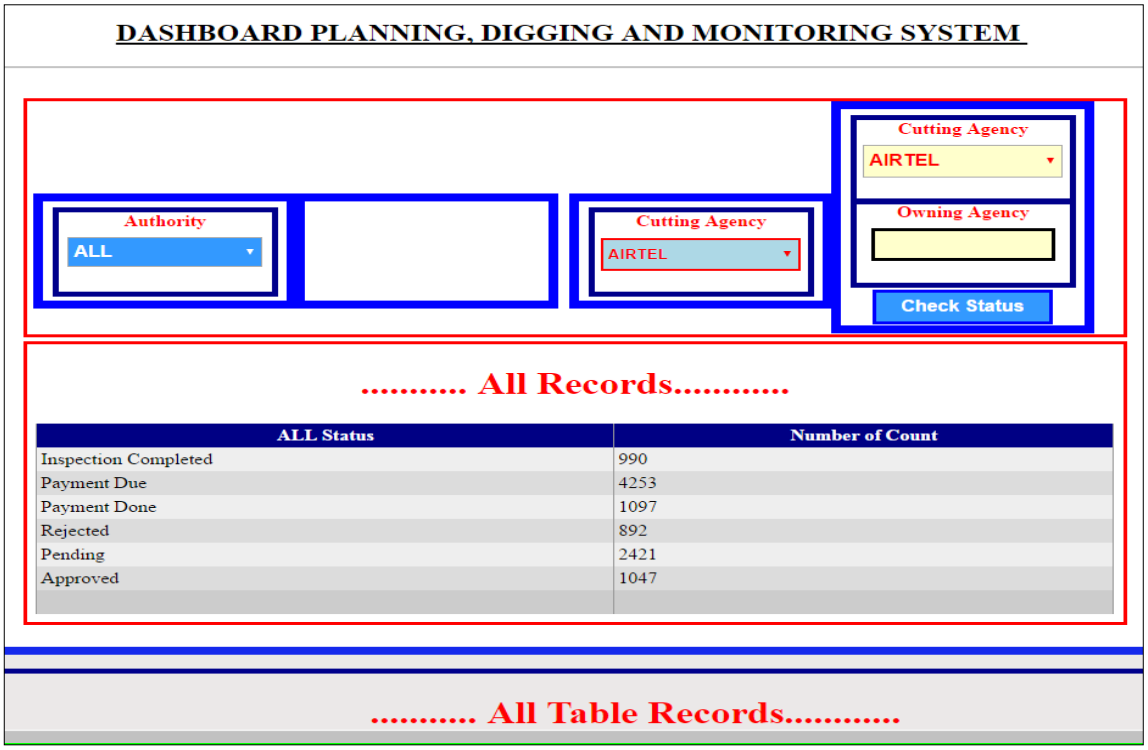


Figure 5: Snapshot of PDMS Dashboard

(Source: http://gsdl.org.in/pdms/, accessed on Jan 15, 2018)

Summary

This chapter presented a broad picture about PDMS, its need, genesis and its available online activities. Starting with the evolution of PDMS, the chapter depicted the information related to the reach of road cutting agencies, road owning agencies, citizen engagement activities through PDMS. Elaboration of different processes indicates their distinctive nature in terms of tasks provided on the website. The chapter also highlighted that these activities have managed to engage not only the users of road cutting & road owning agencies but citizens participation in form of transparency or information availability, suggestions, complaints and feedback on projects and processes.

3. Review of Existing System

Chapter Overview

After developing an understanding of PDMS as a fully online service delivery portal, a comprehensive review and assessment has been done in accordance to the defined methodology and assessment framework. This study has given a holistic approach in terms of adopting best practices, optimal technology usage, performance benchmarking, achievements and shortcomings so far, which is expansive in its breath. Now, to understand the reasons behind both the achievements and the shortcomings, a vertically exhaustive analysis is required to delve deeper into the silos of PDMS's technical, organizational and social aspects.

Hence, in the chapter, an efforts were initiated into examining PDMS in absolute terms such as technical, economic, operational/organizational and social (TEOS). A detailed SWOT analysis has also been carried out in this section to outline the in depth context of PDMS. Attributes of good governance are also studied to measure how PDMS has fulfilled these attributes (Section 3.1). The chapter further covers the analysis of PDMS with similar national initiatives also (Section 3.2). A detailed SWOT analysis spread over TEOS aspects illustrates the feasibility study and forecasting the opportunities and risk factors of PDMS (Section 3.3). Technical aspects of PDMS including technologies used, APIs integrated and compliance to GIGW are also covered here (Section 3.4). Economic aspects which intends to cover study of existing revenue model and fee structure details (Section 3.5). Subsequent section studies organisational and operational aspects of PDMS comprising of extents of services, process reformation in PDMS and present organisational structure (Section 3.6). Social aspects of PDMS studied the societal impact and behavioural change in acting stakeholders of system (Section 3.7)

3.1 Good Governance Attributes and PDMS

The concept of governance has evolved over a period. And 'Good Governance', popularly accepted as a utopian form of governance, upholds the core principles of participation, transparency, responsiveness, effectiveness, and accountability (UNDP, 1997)[3].

Broadly, when we amalgamate IT and governance together to address the needs and aspirations of the citizens, it is termed as e-Governance and e-Governance is expected to be the tool to achieve Good Governance.

[3] *UNDP. (1997). UNDP Policy Document on Good Governance Practices for the Protection of Human Rights. New-York & Geneva: UNDP.*

'Good Governance' strives to create a long term, sustainable paradigm of incentives, disincentives and regulations that is expected to fulfill citizens needs and aspirations .

Figure 6: Characteristics of Good Governance (UNDP 1997)
(Source: UNDP. (1997). UNDP Policy Document on Good Governance Practices for the Protection of Human Rights. New-York & Geneva: UNDP.)

Such insistences of achieving the attributes of Good Governance in its processes have propelled public delivery agencies to extensively rely on information technology (IT) for making public service delivery mechanisms more transparent and people-oriented. Therefore, the word 'governance' has almost become synonymous to the word 'e-governance', indicating that the application of IT/ICT in the processes of governance is expected to become means of achieving good governance.

Analysis of PDMS on Good Governance Model

PDMS being an IT/ICT enabled application dwells in the realm of e-governance tools and its effective use to promote good governance. The system is analyzed on the accepted parameters of good governance to put across its point.

Accountable

'Workflow and Tracking' are the two tools to make the system accountable for its activities or processes. In PDMS, all the activities and related processes including registering on the portal, putting requests, usage of GIS maps, inspection and e-pay approvals has a predefined workflow with respect to specific users. Moreover, all the activities and process execution can be tracked with time stamping in its backend.

Transparent

PDMS strives to bring transparency through upside process reformation through IT/ICT and integrating multiple agencies on one platform. Access to information and status reports can be fetched from the portal easily.

Responsive

PDMS empowers all the stakeholders involved. It has Road Owning Agencies & Road Cutting/Digging Agencies as the crucial (acting) stakeholders. Other related organizations also gets informed and involved indirectly. Inclusion of anticipated stakeholders in the system is also in the pipeline.

Equitable & Inclusive

Government and citizen interaction is the foundation of a good governance system. PDMS system has inbuilt communication facilities to engage stakeholders in the complete process and has empowered citizen to interact anytime anywhere which makes it equitable. PDMS to be inclusive allows citizens to view, suggest, complain and update information on the portal related to road cutting projects.

Effective & Efficient

PDMS is getting utilised fully and no request is processed manually. Number of processed applications has increased and processing time has decreased drastically. Further, use of GIS and online payment has made it more effective and efficient.

Follow the Rule of Law

PDMS is compliant to the processes of Govt. of NCT of Delhi. For any discrepancy and dispute, Jurisdiction of India is applicable.

Participatory

Citizen is the most vigilant medium available for the government for any project validation on ground. Status can be verified, inputs can be captured and uploaded, suggestions can be collaborated and implemented; and citizen participation is the key to achieve such crowd-sourcing environments. Despite, PDMS is not engaging citizens directly but provides the interface for citizens to participate freely and will be given more tools for analysis in the roadmap.

Consensus oriented

PDMS has evolved the consensus oriented approach since its design and development. All the stakeholders were considered for their needs and aspirations for such system and it was built using agile methodology. An ecosystem integrating diverse agencies has been encouraged with the consensus of these agencies within themselves.

3.2 Study of Similar National Initiatives

As road cutting and digging is undertaken by various agencies for several reasons; and the owning agencies have their defined mechanism to approve a road cutting/ digging proposed by the respective agencies. Preliminary study has derived an observation that, in India there are numerous initiatives embarked by State/UTs government bodies, Urban Local Bodies (ULBs). Apparently, contextual background of PDMS is a bit ahead due to integration of GIS 3D Maps. In the same vein, to understand the contexts of such similar initiatives and ascertain the distinctiveness of PDMS, a study of similar initiatives has been undertaken.

Choice and Observation of Online Road Cutting Portals

This particular part of the study briefs about the similar practices being undertaken in various states which are identified through preliminary study. The portals of each of these initiatives were observed for the kind of services provided by them, agencies/ entities involved in the process and the number of techniques, each

portal was employing to implement these activities. Preliminary study helped to identify following initiatives from various states of the country:

i. BBMP Citizen Services - Road Cutting (Online Road Cutting Permission System) by *Bruhat Bengaluru Mahanagara Palike* (Bengaluru Municipal Corporation), Karnataka
ii. Online Civic Services Under Greater Chennai Corporation, Tamil Nadu
iii. Road Cutting / Row Permission for Electricity Connection by Govt. of Telangana
iv. Road Cutting/Right of Way Permission for Electricity Connection by Govt. of Andhra Pradesh

A brief overview of these initiatives has been illustrated below (Table 3):

Table 3: Study of Similar Initiatives t National Level

Sr. No.	Initiative Name	Governing Body and State	Brief Description
1.	Planning, Digging & Monitoring System (PDMS)	Govt. of NCT of Delhi, Delhi	PDMS portal provides online road cutting permission within Delhi for utilities of different departments *viz* DJB, IGL, DTL, NDPL, BSES, DMRC, MTNL, DMRC, PWD URL: www.gsdl.org.in/pdms
2.	BBMP: Citizen Services Road Cutting (Online Road Cutting Permission System)	*Bruhat Bengaluru Mahanagara Palike,* (Bengaluru Municipal Corporation), Karnataka	This portal is basically for citizens and it helps them in applying online for road cutting permission for domestic utility services like water, sanitary and electric connection. URL: http://bbmp.gov.in/road-cutting
3.	Online Civic Services Under Greater Chennai Corporation	Greater Chennai Corporation, Tamil Nadu	This portal provides road cutting permission to Electricity Board, Metro Water and Telecom departments. URL:www.chennaicorporation.gov.in/online-civic-services/index.htm
4.	Road Cutting / Row Permission for Electricity Connection Government of Telangana	Commissioner & Director of Municipal Administration, Govt. of Telangana	This portal provides road cutting permission for the purpose of electricity connections only. URL:www.cdma.telangana.gov.in/Road Cutting.html
5.	Road cutting/Right of way permission for electricity connection, Government of Andhra Pradesh	Roads and Buildings Department, Govt. of Andhra Pradesh	This portal also provides road cutting permission for the purpose of electricity connections only. URL: https://aprcrp.apcfss.in

(Source: IIPA Preliminary Study)

These initiatives are further compared on their basic traits such Usage of GIS 3D Maps, Electronic Payment Interfaces, Integration of Agencies, Multiple Service Delivery Channels etc (Table 4). The identified basic traits of these portals are based on the amount of process reformation and IT/ICT amalgamation within the system, they propose:

- To corroborate the efforts of initiative in IT/ICT usage *viz.* GIS Maps, Service Delivery Channels etc.
- To gauge the collaborative and integrated efforts encouraged through the initiative.
- To analyze the efforts of initiative to bring in the accountability, transparency and convenience in the system. *viz.* e-Payment, Mobile App etc.

Table 4: Comparison of PDMS with similar national initiatives

Initiatives / Parameters	Telangana	Karnataka	Tamil Nadu	Andhra Pradesh	Delhi
Usage of GIS 3D Maps	X	X	X	X	✓
Electronic Payment Provision	✓	✓	✓	✓	✓
Integration of Agencies	X	X	✓	X	✓
Multiple Service Channels	X	✓	X	X	X

(Source: IIPA Preliminary Study)

Observations:

- PDMS has stood distinct in its nature by utilising GIS Maps, e-Payment and integrating multiple agencies (various road owning and cutting both) on one platform. It creates the scope for strengthening the system by offering multiple service delivery channels.
- Provision of e-Payment has been extended by all the five initiatives.
- Initiative of Greater Chennai Corporation has succeeded in putting efforts to integrate the multiple stakeholders in the system leaving the scope for anticipated stakeholders as well.
- Citizen driven initiative of *Bruhat Bengaluru Mahanagar Palike* (Bengaluru Municipal Corporation) has been serving only to individual citizens and extended the service through a mobile application also (in which no other initiative has made an effort yet.)

3.3 SWOT Analysis of PDMS

As a first step to build a holistic understanding of PDMS, a structured analysis has been undertaken to identify the Strengths, Weaknesses, Opportunities and Threats, which might exist within PDMS or emanate from outside the PDMS ecosystem. These parameters have been identified for all the four different aspects of PDMS *viz.* T – Technical, E – Economic, O – Operational/Organizational and S – Social.

The planned analysis undertaken by the deployment of the SWOT tool would therefore helps to focus on the areas of influence and to simultaneously take

measures to improve the identified vulnerable aspects of PDMS. Such elaboration would also stand by stead for designing proactive strategies to minimise the possible threats and at the same timeto be geared up to take advantage of the opportunities strewn by national and international trends.

Strengths (Table 5) and Weaknesses (Table 6) are internal to PDMS whereas the Opportunities (Table 7) and Threats (Table 8) are external in nature and could stem from changing competitiveness, advent of future technologies or ever escalating aspirations of the citizenry.

Table 5: SWOT Analysis of PDMS - Strength

Strength
T - Technical 1. Highly distributed, replicable and scalable architecture of system 2. Use of spatial technologies and 3D GIS Mapping 3. Multi-layered maps being integrated 4. Access to registered agencies only 5. 24x7 Accessibility to the portal 6. Optimal website aesthetics 7. Independent design and development units 8. Can easily be tweaked as and when required
E – Economic 1. Funded by state government 2. Self sustainable 3. Optimal processing fees are incurred
O - Operational/Organizational 1. Effective process reengineering 2. Brining standardization and uniformity in the process 3. Wide array of activities and operations 4. Fully online execution - avoids manual proceeding of the system 5. Operation support through dedicated support line
S - Social 1. Online feedback and grievance system 2. Updated informative dashboard depicting statistics and status

(Source: IIPA Findings)

Table 6: SWOT Analysis of PDMS - Weakness

Weakness
T - Technical 1. Lack of self-explanatory activities on home screen 2. Lack of dedicated Uniform Resource Locator 3. Lesser visibility of PDMS through other digital platforms of GNCTD 4. No other service delivery channel except portal 5. Portal is yet to be in responsive form 6. Poor cyber security and data validation measures 7. Display of time-stamping on activities cannot be seen 8. Data Security Concerns 9. Weak prompt alerting system
E - Economic 1. Lack of dynamic fund allocation to developers 2. Only one payment gateway has been integrated 3. Unable to process multi-type road digging requests and related transactions

O - Operational/Organizational 1. No back-up service delivery mechanism in case of failure 2. Limited organisational support 3. No system charter for service delivery 4. No periodical review and evaluation of the initiative 5. Requires special focus on intergovernmental communication 6. Poor mechanism for resolving emergency cases 7. No mechanism for refund is observed
S - Social 1. Lack of promotional and awareness activities 2. Less outreach of system dashboard to citizens and other stakeholders

(Source: IIPA Findings)

Table 7: SWOT Analysis of PDMS - Opportunities

Opportunities
T - Technical 1. High end cyber security and data protection measures can make it more reliable. 2. Improved scope to enhance existing portal 3. Service delivery through mobile app 4. Weak Payment Gateway services
E – Economic 1. Timely review and amendments in the policies 2. Devising financial model for other agencies seeking PDMS services
O - Operational/Organizational 1. Revamping of organizational structure to manage resource utilization 2. Dynamic information dashboard 3. Remaining road agencies can be brought on board 4. Periodical updates in database of concerned officials
S - Social 1. Improved outreach strategies both online-offline to be devised (in case of) 2. Huge upside scope for publicizing of PDMS as a distinctive e-gov initiative

(Source: IIPA Findings)

Table 8: SWOT Analysis of PDMS - Threats

Threats
T - Technical 1. System and network failure due to unexpected loads
E - Economic 2. Possibility of obstructed financial support
O - Operational/Organizational 1. Possible repercussion of frequent changes of leadership, administrative and team etc. 2. Diluted acceptance of the platform as a result of the above threats
S - Social 1. Unexpected change in social behaviour of crucial actors of the system 2. Probable misusage of the data if captured by unauthorized users

(Source: IIPA Findings)

It is evident that this SWOT tool provides a valid macro level insight into the positive attributes (strengths) internal to PDMS as well as lends a comprehensive understanding of those factors that seem to be detracting PDMS from its stipulated

objectives. The external positive factors (opportunities) are very relevant as they could catalyze growth of PDMS.

3.4 Technical Aspects

The review of existing system in technical aspects tries to understand the technical integrities that PDMS is paving currently. This section includes information related to technologies used, GIS 3D Maps, interoperability, APIs used and compliance to GIGW.

Technologies used in PDMS

- PDMS is a web based application developed in .NET, Java, JavaScript, C#.
- Database management is handled through open source application i.e. PostegreSQL.
- Importantly, PDMS depends on ArcGIS Map API for integrating 3D maps which are multilayered and Payment Gateway API for online payment services.
- Microsoft Silverlight application and IIS Server are also used to facilitate GIS 3D Maps.

The review also noticed that the Microsoft Silverlight Application, which is being used for the PDM application is browser dependent (on Internet Explorer / Mozilla Firefox). GSDL and DeGS Sources have communicated the ongoing development of browser independent solution.

GIS 3D Maps

PDMS prominently brings out the utilisation of Spatial GIS 3D Maps in the system. Delhi State Spatial Data Infrastructure (DSSDI) project of GNCTD has implemented as a 3D GIS solution including generation of large-scale base maps from the aerial photographs obtained in 2007 to cover the state of National Capital Territory of Delhi in an area of about 1500 sq kms. A total of 385 layers have been created, which are updated from time to time by DSSSDI. Satellite Imagery of 2015 is being used in PDMS which has been procured from NRSA.

PDM System has engrossed with following utility layers in the GIS Maps:

1. Under Ground Utility Details
2. Gas pipe line
3. Underground Cable HT
4. Underground Cable LT
5. Power Line EHV
6. Metro Tunnel
7. Underground Metro Line Network
8. Road centre line
9. Railway Line

DSSDI has succeeded in attaining compliance with the Spatial Data Standards to facilitate data sharing, integration, and compatibility among users within the GIS System. Both spatial and attribute cleaning has been done along with updation and generation of new layers using inputs from departments and Satellite imagery, for improving end results.

Compliance to Guidelines for Indian Government Websites (GIGW)

Government of India's National Informatics Centre (NIC) has devised standards in the form of Guidelines for Indian Government Websites (GIGW). GIGW promotes standards that are broadly placed over the functionality, technicality, promotion, information and ownership of the website instrumented by respective government department[4].

These specific guidelines have been formulated to bring all government websites on a uniform standardized platform, hence the compliance to these guidelines is meant to be an imperative achievement for the respective departments. Compliance with GIGW ensures that a website is user-centric, usable, & universally accessible at all stages: starting from launch, continuing during its operations &maintenance. Standardisation Testing and Quality Certification (STQC) is the competent authority of Government of India for GIGW compliance certification.

GIGW Compliance matrix provides a checklist of 115 mandatory guidelines/checkpoints. Majority of these checkpoints relate to the front end of the website (accessibility, identity, content, and design) while others relate to backend policies, processes and plans to enable better management of websites. These 115 checkpoints are exhaustive and cover all the possible scenarios that may apply to the entire universe of government websites. There may be few government websites to which each of the 115 checkpoints may be applicable. A majority of government websites may be such that while most of the 115 checkpoints would apply, some checkpoints may not be applicable[5].

This study has emphasized on few of these parameters which are prominently applicable to PDMS, its nature and service delivery aspects. A concise compliance matrix shows that PDMS portal has succeeded in attaining compliance to the GIGW parameters (Table 9). Further, PDMS draws out a scope for upgrading in terms of linking with National Portal, getting the domain of 'gov.in or nic.in', recovery mechanism and upbeat awareness and promotion.

Table 9: Compliance to GIGW

Sr. No.	Parameters	Sub-parameters	Compliance
1.	Government of India Identifiers	Use of Govt. Emblem/ Logo prominently	Yes
		Display of ownership info	No
		Self explanatory title on home page	Yes
		Whether Website domain registered on 'gov.in / nic.in'	No
		Link to National Portal of India	No
2.	Building Confidence	Display of Copyright Policy	Yes
		Mechanism to ensure 'No Broken Links' and 'Page Not Found' errors	Yes
		Comprehensive 'Terms and Conditions'	Yes
		Privacy Policy linked from all relevant pages	Yes

[4] Guidelines for Indian Government Websites (GIGW) Compliance and Certification Handbook
[5] Guidelines for Indian Government Websites (GIGW) Compliance and Certification Handbook

		e-Transactions handled through secure means	Yes
3.	Scope of Content	Appropriate and self explanatory information on the tabs of websites such as Home, About Us, Services, Circulars & Notifications, Tenders, News etc.	Yes
4.	Quality of Content	Compiled and Packaged Contents with user orientation	Yes
		Clear and Simple Language throughout website	Yes
		Error free spellings and grammar	Yes
		Time-stamping on website	Yes
		Preserving presentation style in information structure and relationship, meaningful reading sequence	Yes
5.	Design	Proper ratio and design of National Emblem and Flag	No
		Loss of layout in case of regional languages	NA
		Link to home page from all the relevant pages within website	Yes
		Links to 'Under Construction' Pages	Yes
		Allows resizing of text without assistive technologies	Yes
6.	Development	Purpose of each link is clear to users	Yes
		Documents provided are in HTML or accessible formats.	Yes
		All input errors are flashed in text.	Yes
		Validation of Metadata for the data fields	Yes
		Website tested on multiple browsers	Yes
7.	Website Hosting	Website Access to the intended audience in an efficient and secure manner on 24x7 basis	Yes
		Regular back up by Hosting Service Provider	Yes
		Helpdesk and technical support by hosting service provider on 24x7x365 basis	Yes
		Disaster Recovery Centre by hosting service provider	No
		All possible security measures for defacement and hacking of website	Yes
8.	Website Promotion	Ranking of website in 'first five' when searched on major search engines	Yes
		Promotional activities of the respective department includes URL and name of the website	No
9.	Website Management	Nomination of Website Information Manager by respective department	Yes
		Website monitoring Policy	Yes
		All policies and plans are approved by Head of Department	Yes

(Source: IIPA Primary Findings)

3.5 Economic Aspects

PDMS has thrived to bring the uniform and standardized pricing structure for overall system. PDMS has defined the road types and respective cutting/digging charges for road cutting agencies. Earlier these charges were being fixed by Road Owning Agencies separately. Pre –PDMS charges fixed by road owning agencies were approximately INR 3500 per square meter for road cutting and restoration thereof. The primary research has shown revised fee structure with respect to road type as given below (Table 10).

Table 10: Present Road Cutting Charges given by PDMS

Present Charges for road cutting (per sqm)	
Type of Road	Respective Charges
1. Bituminous Road up to 6M right to way	1385.00
2. For Bituminous road from 6M to 12M ROW	1626.00
3. For Bituminous road from 12M to 18M ROW	2298.00
4. For Bituminous road above 18M ROW	2831.00
5. CC Road up to 12.5cm thickness	2043.00
6. CC Road above 12.5cm thickness	3799.00
7. Extra for Bituminous road (BM+AC)	942.00
8. Extra for Bituminous road (Mastic)	1028.00
9. Dry brick paved road	525.00

(Source: IIPA Primary Findings)

This standardization in the fee structure has reduced rate of discrepancy in the processes and helping road cutting agencies to curtail their costs.

Existing Financials

The current source of revenue for PDMS is limited to processing/convenience fees incurred by the processed requests from Road Cutting Agencies (RCAs). In spite of PDMS being an electronic service delivery platform that offers a niche array of services to concerned Road Owning Agencies (ROAs) and RCAs. Presently, PDMS charges INR 5000 for processing the road cutting requests. It has been observed that there is an absence of a dedicated revenue generation model based on the nature and type of engagement DeGS and GSDL is putting in. Hence, all the CAPEX and OPEX (fixed and variable costs) of PDMS, including general & administrative expenditures and cost overheads, are being accounted from the financials from service delivery and raise by Department of Information Technology, GNCTD.

Furthermore, as confirmed from GNCTD resources, in order to accumulate technical advancements, support and human resources in future; PDMS is suggested to develop an advanced self-sustaining revenue model for proper functioning and achievement of the goals of PDMS.

3.6 Operational/Organizational Aspects

Operational Reformation through PDMS

PDMS has tried to bring up-side process reformation in its service delivery context. Effective process reengineering and advanced technologies (Spatial GIS Maps) have helped PDMS to come up as single-window electronic service delivery platform. A parity check for previous manual system of road cutting permissions with present PDMS has been done in order to perceive the operational reforms through PDMS (Table 11).

Table 11: Comparative Analysis (Earlier System Vs PDMS)

Sr. No.	Parameters	PDMS Web Portal	Manual System
1.	Avoid visits of Road Cutting Agencies to multiple offices of Road Owning Agencies for getting permission of road cutting/digging	✓	X
2.	Government (Business) Process Engineering (GPR)	✓	X
3.	Change Management and Capacity Building Efforts	✓	X
4.	Security of data/files/ applications	✓	X
5.	Standardized rates for road cutting and related disputes	✓	X
6.	GIS Maps (Underground/Over ground utilities)	✓	X
7.	Time Limit for disposal of requests (Turn around Time - TAT)	✓	X
8.	Accountable, Transparent, Agile Service Delivery	✓	X
9.	Online Payment for services	✓	X

(Source: IIPA Primary Findings)

Organizational Aspects

Presently, PDMS has a pool of human resources deployed within their organization such as DeGS and GSDL. These individuals are the practitioners in diverse areas such as Administration, Management, Technology, Data Content Management etc. They are currently engaged in surplus work load because shortcoming of dedicated human resources. Looking at the expanding work of PDMS, it creates a huge scope for deploying additional human resources supported by hired manpower, other domain specialists and advisors to achieve efficient and agile task management.

3.7 Social Aspects

PDMS is a service delivery platform facilitating interaction and services in between government agencies i.e. G2G (which are road owning agencies) and enterprises i.e. G2B (which are road cutting agencies also). Social aspects are considered from two perspectives – i. Societal impact of PDMS and ii. Behavioral change in active stakeholders

Since, Road Cutting and Owning Agencies are the key acting stakeholders of PDM System and citizens are not directly involved in its intended process. However, citizens can be part of PDMS periphery by following ways –

- Citizens can access information, see the status of road cutting requests on PDMS portal.
- PDMS portal also allows citizens to give their feedback and register their grievances online about the completed/ongoing road cutting.
- PDMS information dashboard allows users to see overall statistics of PDMS services which is also categorized in road owning agency and their zone.

By such means PDMS has encouraged efforts towards bringing transparency, information sharing and online escalation through grievances. The behavioral change of acting stakeholders has been studied on the basis of primary research and the observations related therein are covered in subsequent chapter.

Summary

On the basis of analyses, it is noted that special attention is to be laid on technical advancement and ease of usage achieved through it. Concerns related to browser dependent application interfaces, single e-payment interface and limited human resources need to be considered for immediate reformation. A summary of emanated from the study this chapter is enlisted as below:

- PDMS has strived to meet the objectives of good governance through its operability and amalgamation of ICTs in its execution. It is also coming out as unique initiative when compared with other similar national practices.
- Compliance to GIGW stated that PDMS should adhere to the imperative guidelines being a government service delivery platform.
- PDMS has also observed a remarkable process reformation in order to improve the efficiency of system. Even the standardised structure of processes and outcomes has brought the equilibrium across diverse agencies dealing in PDMS.
- Study of existing revenue model and organisational aspects – infrastructure and human resources has also found that, further enhancements may be implicated.
-

The study in this chapter has not just comprehended the existing institution of PDMS but also helped us to analyse its performance and derive recommendations for its enhancements using related suitable processes. After reviewing the system, the next section further analyses the system based on primary research. All the attributes and recommendations to enhance the existing system are integrated in subsequent sections after primary research study.

4. Research Analysis of PDMS

Chapter Overview

This chapter intends to cover the primary research undertaken to study PDMS on real time basis. IIPA research team has conducted multiple interaction rounds through stakeholder consultation, round table, f2f interviews and survey. These interactions have helped to extract the real time primary data about PDMS. Further, the survey method has been used to capture the main data by undertaking a *round table consultation* with audience comprising of all the stakeholders of the portal (ROAs, RCAs, GNCTD senior IT management, portal designers from GSDL and DeGS, citizens and research team of PDMS). A primary research tool was used to collect the data through these interactions. The purpose was to collect data on the basis TEOS framework of analysis. Data to be collected was more in nature of perception as felt by users over a period.

Sample Used - The study exercised a convenience sampling method to obtain responses from users of PDMS. The idea was to represent PDMS users in a non-discriminatory manner. Further, even though the PDMS portal has three kinds of users - Road Cutting Agencies (RCA), Road Owning Agencies (ROA) and Citizens, the first one, viz. RCA constitutes the most important end-user of the portal, therefore the sample composition also tilted in favour of RCA representation which was noted 70% of the total respondents. The total constituents of the survey through round table were thirty-one in number, only twenty-six responded back with the entire completed tool.

About the Round Table Discussions on PDMS conducted on Jan 10, 2018

With the comprehension of existing system through its review and preliminary study, it was felt prudent to undertake a concerted interaction round with all stakeholders of PDMS hence; a Round Table Discussion on PDMS was successfully conducted jointly by IIPA and GNCTD on Jan 10, 2018 at GNCTD office. This round table round was aimed at understanding the PDMS from the perspectives of all its key stakeholders with special focus on 'Road Cutting and Owning Agencies'. Further, it was also intended –

- To understand the impact of PDMS since its inception.
- To discuss challenges and concerns of ROAs and RCAs related to PDMS.
- To support primary research about PDMS for ongoing Impact Assessment through designed survey tool.
- To understand needs and aspirations ROAs and RCAs about PDMS.

The said round table discussion was made resourceful and fruitful by more than 40 participants from various road cutting agencies (BSES, IGL, ECIL, Airtel, Idea etc.), road owning agencies (SDMC, EDMC, NDMC) and officials from Dept. of IT, GNCTD. It was started with an introductory briefing by the officials from GNCTD. After which, IIPA Team gave a detailed presentation which elaborated agenda and premeditated outcomes of the round table. The elaboration embarked upon the interactive discussions with all the participants steered with facilitation by IIPA Team. All the aspects, challenges and concerns regarding PDMS were brought is discussion. Officials from GNCTD including their technical team also reinforced the discussion

and resolved participants' concerns (such as technical, administrative etc.) After the thorough discussion rounds, IIPA research team conducted the 'Survery of PDMS' through the designed questionnaire. All the participants were also briefed and instructed for the ease of responding to the questionnaire. For encourage participants to respond to questionnaire in rational and non-ambiguous manner, a token of appreciation was also expressed by the round table facilitators. Focus group discussions were also conducted right after the survey in order to understand the feedback and concerns judiciously.

Photo 1: Collage of Photographs of Round Table Discussions on PDMS conducted jointly by IIPA and GNCTD on Jan 10, 2017 at GNCTD, New Delhi

SOME GLIMPSES OF THE DATA COLLECTION PROCESS UNDERTAKEN WITH VARIOUS STAKEHOLDERS






Photo 2: Some Glimpses of Round Table Discussions on PDMS conducted jointly by IIPA and GNCTD on Jan 10, 2017 at GNCTD, New Delhi

All the survey responses, participants' remarks and discussion outcomes were collated and considered for further in depth analysis.

On the basis of all primary data collected through surveys, focus group discussions, f2f interviews a meticulous analysis of PDMS has been done as illustrated below.

- A basic assessment of PDMS focusing on adoption, usage and processing of PDMSs has been carried out here (Section 4.1).
- A detailed analysis based on Technical, Economic, Operational/ Organizational and Social (TEOS) parameters on primary data is also subsequently covered (Section 4.2)
- Primary research analysis based on technical parameters are covering ease of usage, GIS utility maps, design and interface of PDMS (Section 4.2.1); economic aspects comprising of improvement in payment process and cost benefits were also studied through responses (Section 4.2.2).
- Operational/ Organizational aspects cover the study of efficiency of PDMS, improvement in processing requests, time taken for processing, number of complaints received and organizational support (Section 4.2.3).

- The last section of the chapter covers study of social aspects on real time data including access to information, online feedback and grievances and related communications (Section 4.2.4).

4.1 Basic Assessment of PDMS

After successful completion of one year by PDMS, the system has gradually attaining the efficiency and reworking on the issues to be resolved faced by the users. This basic assessment aims to gauge the operational performance of PDMS. The dashboard data shows the efficiency of PDMS in terms of requests processed and completed by the respective Road Owning and Cutting Agencies from its inception in Nov 2016 (Figure 7).

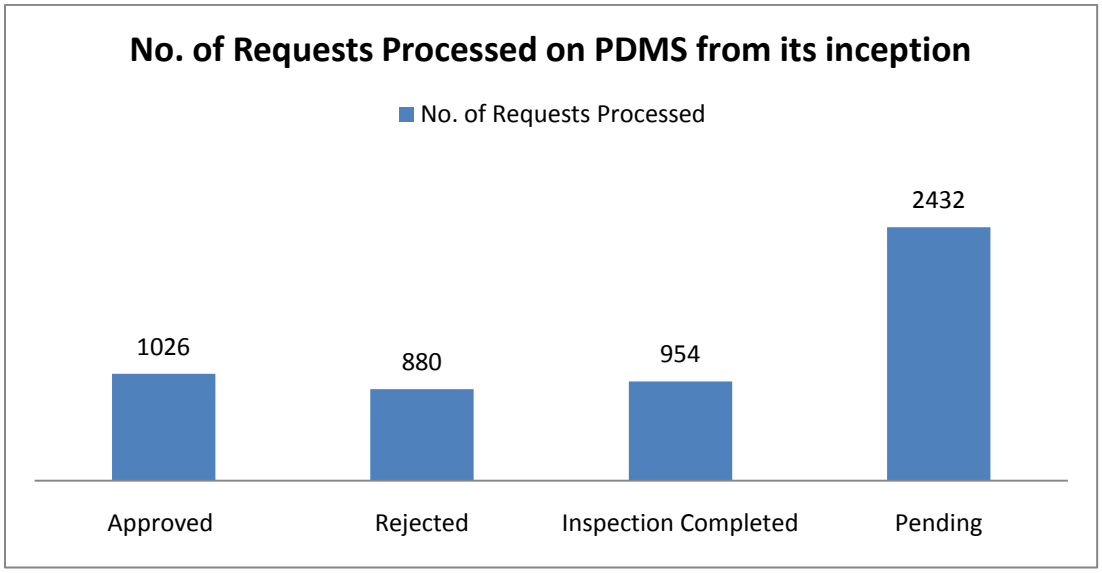


Figure 7: Number of requests processed on PDMS since its inception
(Source: PDMS Dashboard on http://gsdl.org.in/dashboard/(S (ohrw40z3wiqsiph5rmxisjnj))/Dashboard.aspx accessed on Jan 12, 2018)

Adoption, Usage and Processing

Further, below data shows the rate at which PDMS has been accepted and adopted by the stakeholders. The time period has been divided in to two segments of 6 months - First six months from the launch of PDMS and later six months.

An increase in registered users has been observed on PDMS, where in first six of post launch of PDMS there were 78 registered users and later in six months the number increased to 222 (Figure 8). While '246' total active users are noted on PDMS by December 2017.

With the increasing number in registered users, it has been observed that there is a drastic increase by 200% in the number of applications received and processed in first six months of PDMS launch and later six months as well (Figure 9).

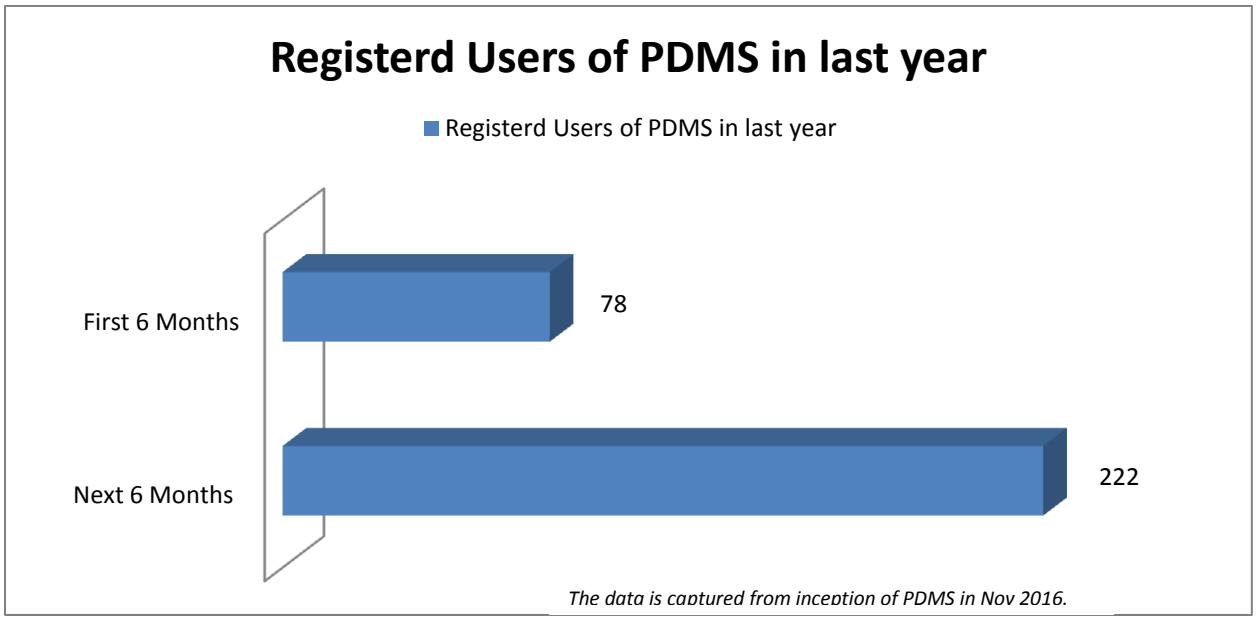


Figure 8: Registered users on PDMS in last one year from Nov 2016 to Dec 2017
(Source: IIPA Primary Findings)

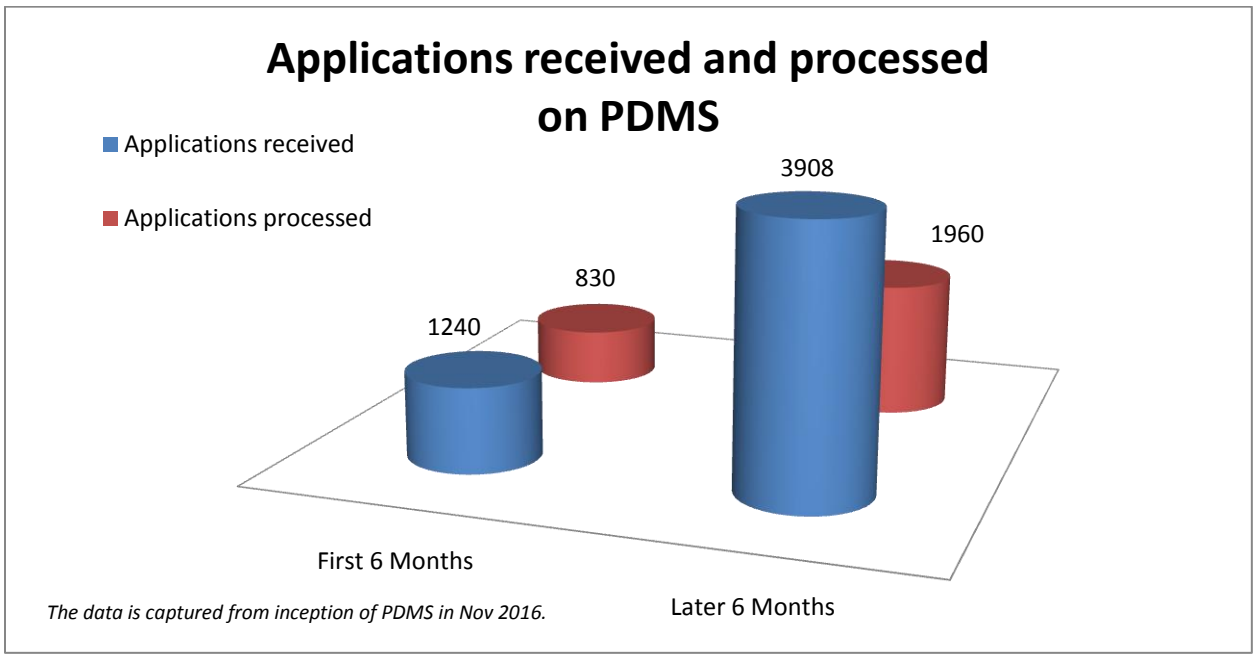


Figure 9: Applications received & processed on PDMS in last one year from Nov 2016 to Dec 2017
(Source: IIPA Primary Findings)

4.2 Analysis based on TEOS

As the basic assessment of PDMS demonstrated an efficient manner of system execution with the increasing number of registered users and requests received & processed within a year from its inception. Further, it was intended to analyse the system on acute facets of PDMS based on following parameters:

- Technical Parameters
- Economic Parameters
- Operational/Organisational parameters
- Social Parameters

First of all, study has taken up a macro-view of the whole parameter in a tabular form to have a clear view of average ratings, our findings, user comments and recommendations. Then average analysis has been carried out on each (sub) parameter of the respective aspect (*viz.* Technical). Furthermore, we have given drill down analysis of captured data of Identified sub-parameter.

Methodology: The survey contained a rating based system, designed to collect the inputs based on performance - Very High to No Performance, in-between stages were High, Average and Low. Additionally, 5-Star rating was also introduced which was understood as a single star means low and 5 stars means very high rating on that parameter. Some questions were designed to gauge the performance based on percentage increase. Percentage scales were defined as 0-10%, 10-25%, 25-50% and more than 50%. A change of '0-10%' is considered a low impact, '10-25% average impact', '25-50%' as high impact and 'More than 50%' as very high impact.

Accordingly, the average rating/score across TEOS is also plotted and analysed, to understand the issues on a bigger spectrum. Average rating/score is analysed separately for road owning agencies and road cutting agencies to understand the point of view of two major stakeholders.

4.2.1 Technical Parameters

Technical parameters related to PDMS such as ease of use, security and robustness, easy reports, GIS drawing on map and their utility were identified by considering the context and ecosystem of PDMS. The extensive analysis on technical parameters in summarised form comprises of perception of both the crucial actors of PDMS, i.e. Road Cutting Agencies (RCA) and Road Owning Agencies (ROA) with their average ratings and impact with respect to each technical parameter (Table 12). It also comprises of primary findings after the analysis, user remarks and recommendations expressed by the respondents through the survey activity.

Table 12: Summarized Primary Analysis of PDMS on Technical Parameters

S No	Parameters	User Rating (Max score of 5)		Impact		
		Road Cutting	Road Owning	Road Cutting	Road Owning	Primary Findings
1	**Technical**					
1.1	Ease of use	3.75	3.5	High	High	Majority of respondents rated it on 'high' and expressed the need of responsive design for different devices & with appropriate aspect ratio.

1.2	Security & robustness	3.45	3.75	Average	High	The study revealed that, PDMS has been certified by CERT-I security certifications. Need of a continuous process of testing was highlighted.
1.3	Easy Reports	3.7	3.75	High	High	More than 50% of the respondents found the system comfortable for accessing and generating reports. And described the need of intuitive, easy to navigate, more reports and dashboards.
1.4	GIS: Drawing on Map	3.15	3.25	Average	Average	Almost all respondents rated it as very good feature. It was further expressed by the respondents to enhance the functionality on maps such as demarcating accurate location, identifying narrow lanes on the map etc.
1.5	GIS: Utility Maps	3.45	3.5	Average	High	Again, a very good feature rated '4 and 5 stars' by more than 50% of the respondents. The need of utilising few more layers on the maps was also brought out in the focus group discussions.

User Remarks

1. Road type should be auto selected according to the request.
2. Some narrow lanes have not been mapped, hence cannot be demarked on the map.
3. Dashboard: Last two tabs are confusing (permission giving and permission approved). Should be renamed.
4. Status details are required and should be available at dashboards.
5. Add two more types 'Clamping of dods/pipes on bridges' and 'encasing of dods/pipes along bridges'.
6. Way to handle emergency cases and cable repairing requests.
7. Need more flexible "Revalidation of application" process due to other agencies (utility) involvement.
8. Overall, PDMS respondents have found remarkable improvement in time reduction

as compared to manual process of digging. Respondents are expecting further reduction in time with the full cooperation of ROA and allied staff.
9. More precise dashboards with role specific bifurcation may be facilitated.
10. Should be able to export dashboard in excel file.
11. Route map uploaded by utility agency does not provide 'Zoom-in' and 'Zoom-out' operations.
12. There should be a system /site where one can update the credentials of concerned staff in case of transfer of official from one Division to other.
13. The PDF map generated eventually sometime gets blackened and the map is not visible.

Recommendations

1. GIS Maps need to be updated periodically.
2. Layer on map containing 'street name/road name' may be incorporated.
3. Any other up to date software can be used instead of MS Silverlight such as Java for accessing GIS maps on client side.
4. Two more cutting/digging types in the database of type master may be added.
5. Role based dashboards with appropriate filters should be made available.
6. Ease of accessing data through reports and dashboard should be there.
7. Respondents should be able to see status of applications easily.
8. Agency-wise display of pending reports.
9. Create process for handling emergency cases and cable repairing cases and put it in system.
10. Responsive design which is mobile ready can be deployed.
11. Server downtime should be looked into and methods should be devised to improve it.
12. Complete Business Continuity should be implemented thoroughly.
13. Disaster Recovery: Not in place. Need to be built on high priority as the system is live and in use for a year.
14. Source Code versioning and backup: Versioning is not in place, high risk and need to be mitigated immediately.
15. Data backup plan: Need to be documented and deployed.
16. Provision to update the profile info to the respective agencies should be enabled.

(Source: Primary Research Analysis conducted on the basis of data collected through round table discussions on PDMS with all the stakeholders held on Jan 10, 2018 at Dept. of IT, GNCTD)

Based on technical parameters identified and studied herein, it was prudent to understand the perception of Road Cutting and Owning Agencies on technical aspects about PDMS.

Perception of Road Cutting Agencies on Technical Parameters

Ease of usage of PDMS has marked itself the most favoured aspect by the respondents from RCAs followed by design and interface of PDMS. Security and robustness of PDMS has been rated by the respondents '3.45' on an average which depicts its moderate acceptance. However, GIS usage and its utilities were brought to be a part of concern and needs further strengthening (Figure 10).

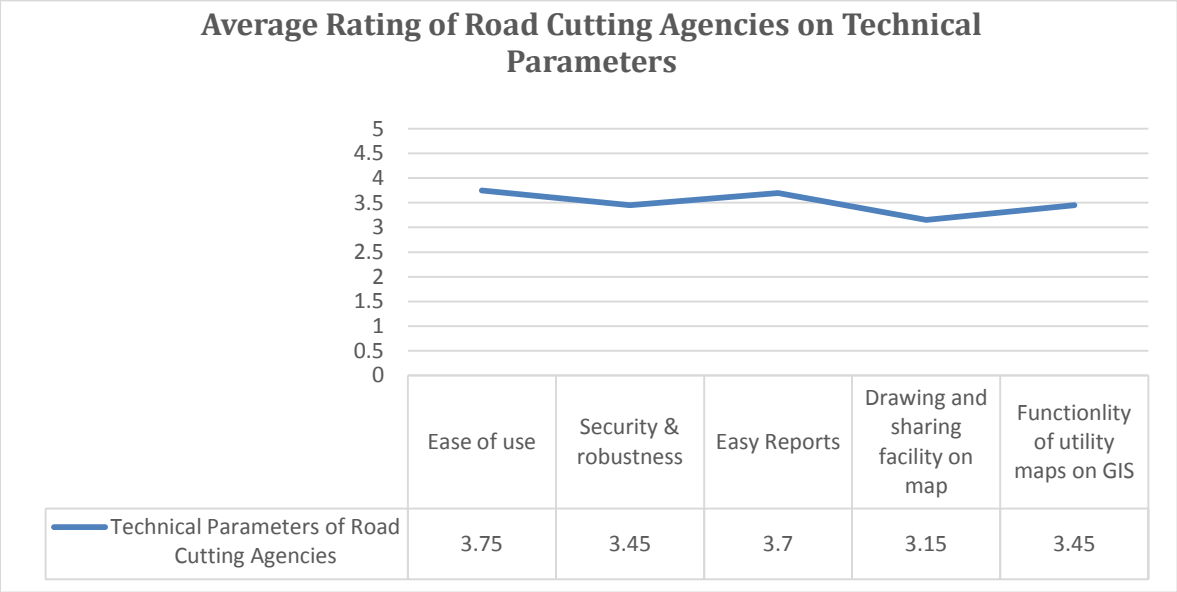


Figure 10: Primary Analysis of PDMS on technical parameters from RCA's perspective
Source: IIPA Primary Research Analysis

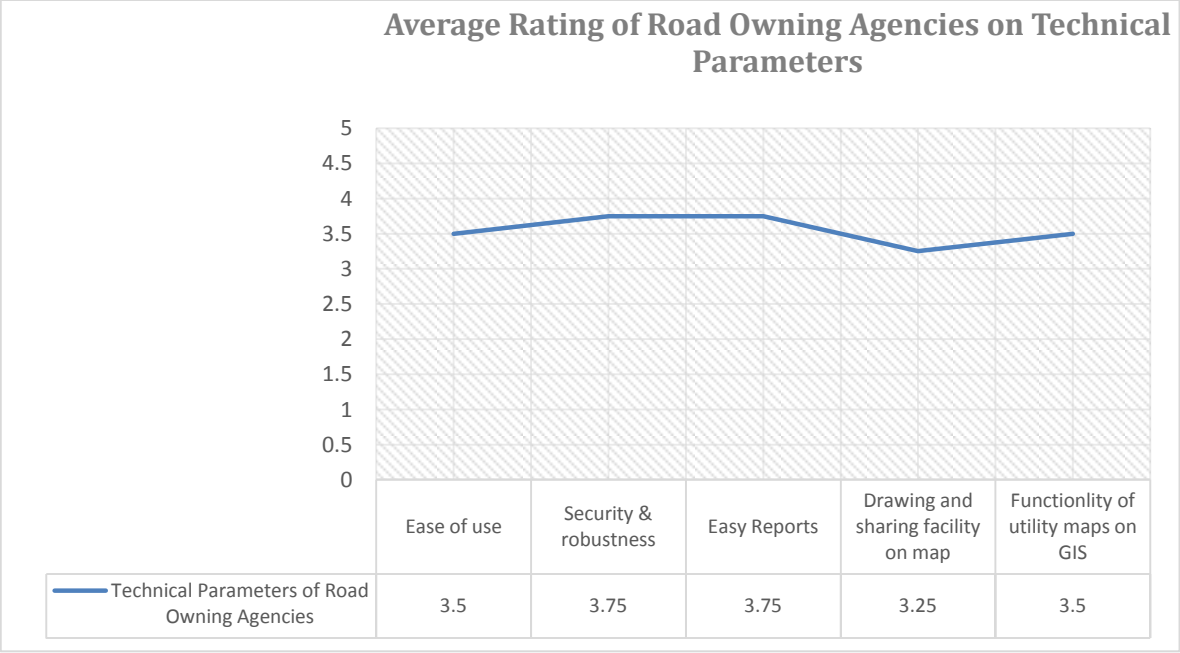
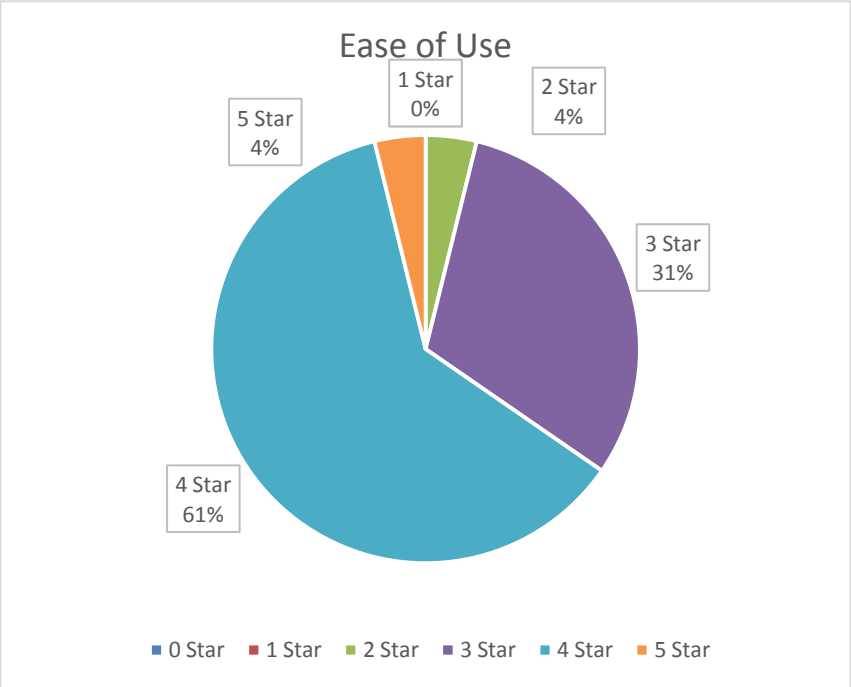


Figure 11: Primary Analysis of PDMS on technical parameters from ROA's perspective
(Source: IIPA Primary Research Analysis)

Perception of Road Owning Agencies on Technical Parameters

Road Owning Agencies have marked their inclination towards the design and interface of PDMS and its security measures. Functionality of GIS maps and its utilities are considered to be moderately adoptive affecting the ease of usage of PDMS (Figure 11). Road owning agencies also rated the PDMS 'very good' on technical

parameters. They have rated the system best on security & design. Utility maps functionality also helps them a lot and they have rated it 'high' as its impact.



Analysis)

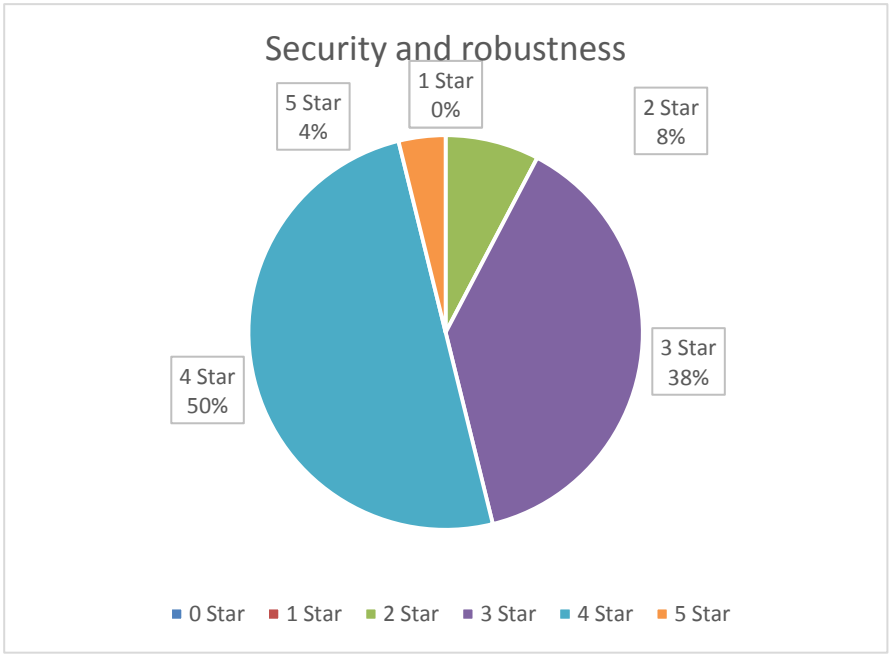
Analysis of Identified Technical Parameters

a. Ease of use

The primary analysis stated that more than 61% of the respondents felt the system to be easy to use by rating it on '4 stars' while 31% of them were moderately satisfied by rating it on '3 stars'. Very few of respondents (4%) are finding PDMS difficult to use (Figure 12).

Figure 12: Primary Analysis of PDMS on Ease of Use (Technical)
(Source: IIPA Primary Research

A good application falls flat on usage if user interfaces designed poorly. Intuitive designs, interfaces, dashboards and navigations, right size and placement of buttons play a vital role in bringing the ease of use to the respondents. Focused group discussions highlighted many concerns related to usability, access to service and information such as more utilities on dashboards, fetching reports and data from dashboards in MS Excel & CSV file formats etc.



b. Security & robustness

Primary data on this parameter confirms that the 54% of the respondents of the system consider PDMS as a robust and secure system. 38% of respondents are moderately happy with security and as per 8% respondents, team need to take security aspect seriously (Figure 13).

Figure 13: Primary

Analysis of PDMS on Security & Robustness (Technical)
(Source: IIPA Primary Research Analysis)

Survey results are good on the security of the system and user perception of security of their data, but these results could be better. Cert-in security testing is done and this need to be continued as the system is evolving. STQC security check is not done and it is advised to get it done.

Areas of attention:

- Application security
- Protection against Virus & malware: Continuous exercise
- Business Continuity: In place but need to be tested thoroughly.
- Disaster Recovery: Not in place. Need to be built on high priority as the system is live and in use for a year.
- Source Code versioning and backup: Versioning is not in place, high risk and need to me mitigated immediately.
- Data backup plan: Need to be documented and put in place.

c. Easy reports

8% of the respondents have given it a rating of '5 stars' whereas 61% of them have given it '4 stars' which illustrates that report generation is felt easy by majority of the respondents. 23% of the respondents have rated it on '3 stars' while '2 stars' by 8% respondents (Figure 14).

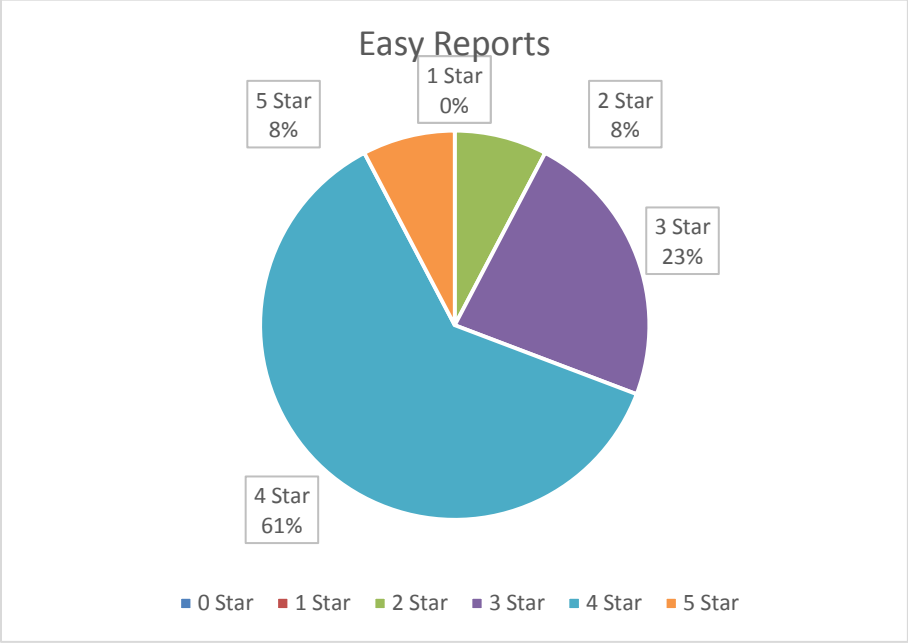


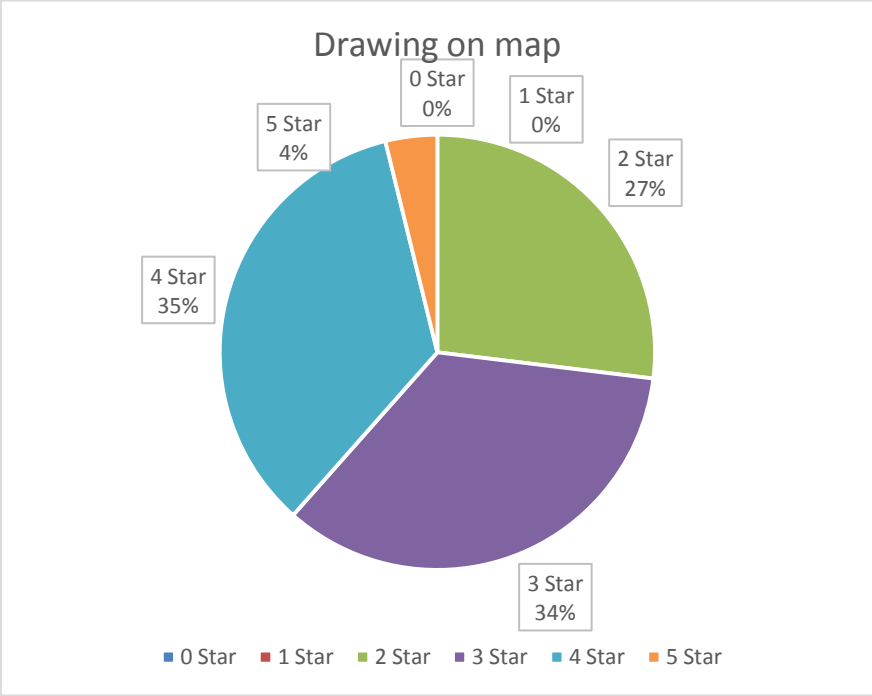
Figure 14: Primary Analysis of PDMS on generating 'Easy Reports' (Technical)
(Source: IIPA Primary Research Analysis)

Reports and MIS are the critical part of the system. An easy report builder can be created so the user can create reports as per their choice. Pre-build reports also required in the system for the quick access and utilisation (in '.pdf/.csv' formats) of data. Respondents are happy with the current dashboard and basic reporting, but this reporting feature can be improved further, as lots of data is being captured but not being utilised appropriately.

d. Drawing on map

Captured results of the primary data showed that collectively 39% of the respondents find this functionality very useful (by rating it 'very high and high'). 34% of respondents find it just useful and have given it average rating. On the other hand, 27% of the respondents find it difficult to demarcate on map who have rated it on '2 stars' (Figure 15).

This is one of the useful features of the application and it's USP (Unique Selling Point). Delhi government has developed 3D maps with multiple layers and these maps are seamlessly integrated with PDMS. When respondents apply for road cutting/digging permissions, they can draw the area on the map for everybody to collaborate and view on the map. This has given a better visual understanding of the request undertaken by the respective users. It aids in Decision Support System (DSS) with a visual map with all the available entities.



Some areas are still difficult to demark because maps are not updated, GSDL needs to coordinate with the respective road owning agencies and update the maps accordingly. This concern was highlighted during the interviews as well. Some of the respondents informed that they are not able to demark some areas because some narrow lanes were not identified on the map.

Figure 15: Primary Analysis of PDMS on Drawing on Map (Technical)
(Source: IIPA Primary Research Analysis)

e. Utility maps functionality

In the primary data collection 50% of respondents showed satisfaction with this functionality by rating it collectively on '5 and 4 stars'. 19% of respondents have rated it '1 star' which states that respondents need more enhancement in this functionality. 31% of respondents are moderately satisfied with this feature (Figure 16).

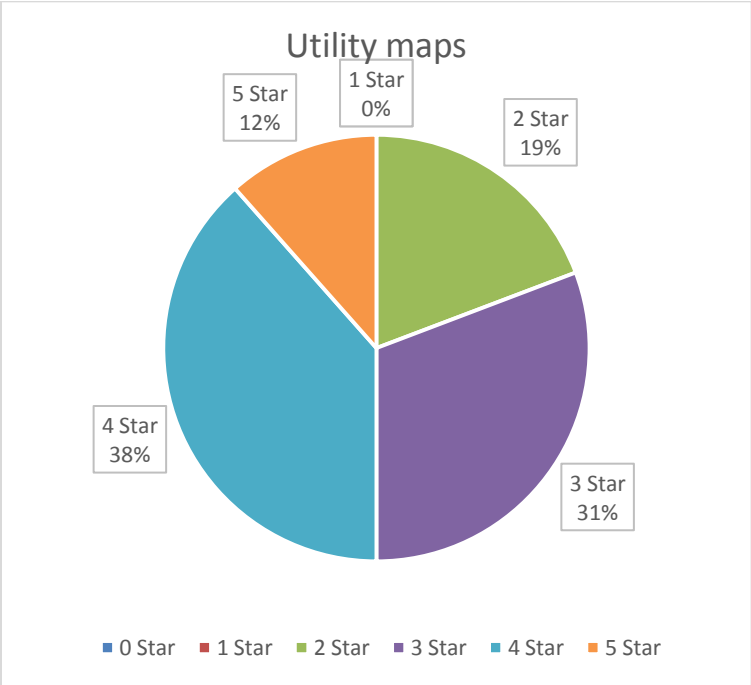


Figure 16: Primary Analysis of PDMS on Utility Maps Functionality (Technical)
(Source: IIPA Primary Research Analysis)

Two main uses of the GIS in this application are - to demark the area and other is to view the other utilities on the map for any possible conflict and information. Utility layers are there but they are not used visually as the map may become too cluttered to understand. Technical team needs to open up the street/road names layer for clear understanding of area and milestones as pointed out by few of the respondents in focus groups interactions.

4.2.2 Economic Parameters

It was pertinent to know how road owning and cutting agencies consider the reformation is economic aspects out of this initiative. From the primary data analysis, it is derived that the impact is from average to high for road cutting agencies, but the impact was noted high as far as road owning agencies are concerned. Economic parameters are analysed on improvement in payment process after the deployment of electronic payment provision and cost-benefit to the respective agency (Table 13).

Table 13: Summarized Primary Analysis of PDMS on Economic Parameters

S No	Parameters	User Rating (Max score of 5)		Impact		
		Road Cutting	Road Owning	Road Cutting	Road Owning	Primary Findings
2	**Economic**					
2.1	Improvement in	3.05	3.25	Average	Average	39% of the respondents feel

	payment process					that the system is 'high or very high' on improvement in payment process. Respondents stated to a mechanism for faster payment confirmations. Refund or adjustment of payment is another major concern to be addressed.
2.2	Cost-benefit	2.8	3.5	Average	High	Road owning agencies consider it as a 'high impact area' whereas 'average impact' is considered by road cutting agencies. 42% of respondents have given it high or very high rating.

User Remarks

1. Online payment confirmation is taking too long to confirm after payment.
2. More gateways should be included.
3. There is no process in system for refund/adjustment in case of applications cancelled by road cutting agency. This process was in place in manual system.
4. Payment status should be clearly defined with RTGS details as well as road owning agency should get the NEFT /transaction for particular request number.
5. Merchant codes on SBI e-pay shall be incorporated from backend and should be made user friendly during payment.

Recommendations

1. PDMS Technical team should coordinate with SBI and sort out the delay in confirmation. Process of payment confirmation should be automated and instant just like all other payment gateways in E-commerce and payment sites.
2. PDMS should integrate more electronic payment methods and gateways.
3. A mechanism for refund and adjustment should be built. There are multiple scenarios where this will be used i.e. cancellation of request by road cutting agency, discrepancy in the process, rejection at later stage after payment etc.
4. Payment process information, confirmation, alerts and notifications should be optimised and SMS alerts/updates should be deployed proactively.
5. Merchant code mapping should be taken care of by SBI and PDMS effectively when it comes to electronic payment.

(Source: Primary Research Analysis conducted on the basis of data collected through round table discussions on PDMS with all the stakeholders held at Dept. of IT, GNCTD, on Jan 10, 2018)

Perception of Road Cutting Agencies on Economic Parameters

Road cutting agencies emphasized that online payment is advantageous; however, with present related concerns derived its performance on 'average'. They also do not see it as a major financial booster and gave it an average rating/score (Figure 17).

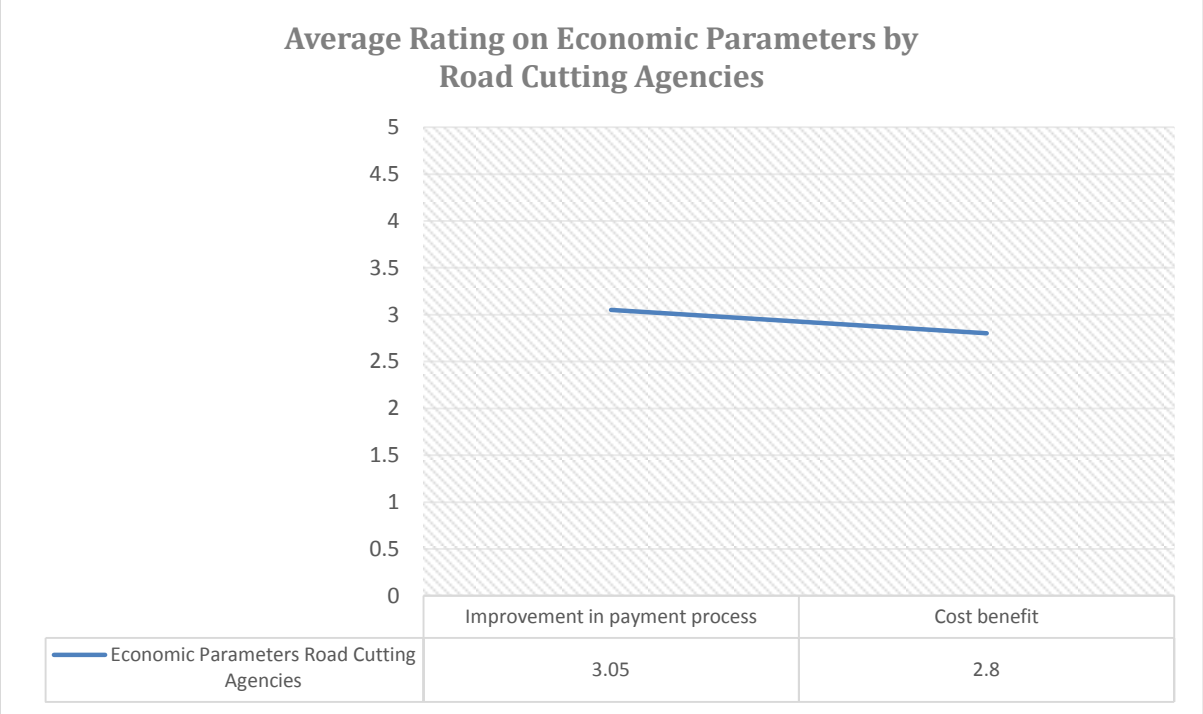


Figure 17: Primary Analysis of PDMS on economic parameters from RCA's perspective
(Source: IIPA Primary Research Analysis)

Perception of Road Owning Agencies on Economic Parameters

Perception of road owning is better in economic parameters as they have rated it slightly more than the average in online payments and they also see a higher cost-benefit in using the system than the road cutting agencies (Figure 18).

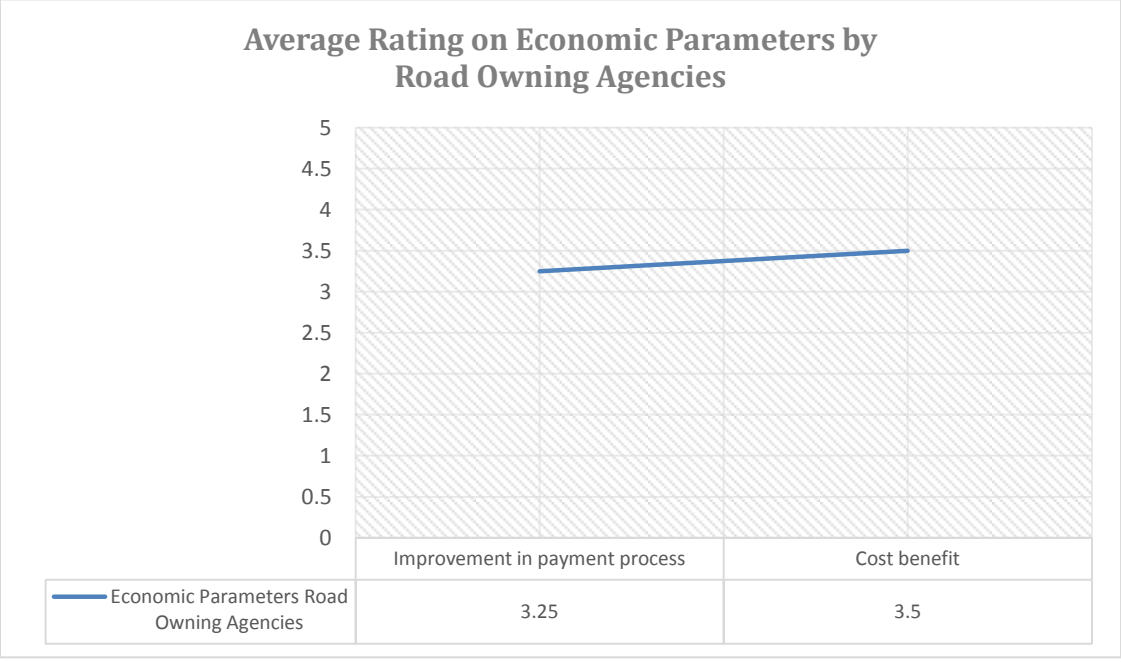


Figure 18: Primary Analysis of PDMS on economic parameters from ROA's perspective
(Source: IIPA Primary Research Analysis)

Analysis of Identified Economic Parameters

a. Improvement in Payment Process

Primary research findings stated that the 39% of respondents find online payment very helpful (collective rating is '5 and 4 Stars'). 23% of the respondents feel a lot need to be done on payment processing with the ratings of '2 stars' or less (Figure 19).

In PDMS all the calculations are executed electronically and validated by the concerned engineers. Payments are accepted online using the SBI payment gateway and confirmed by the system. As per the survey and the subsequent interviews, this is an area that needs lot of improvements.

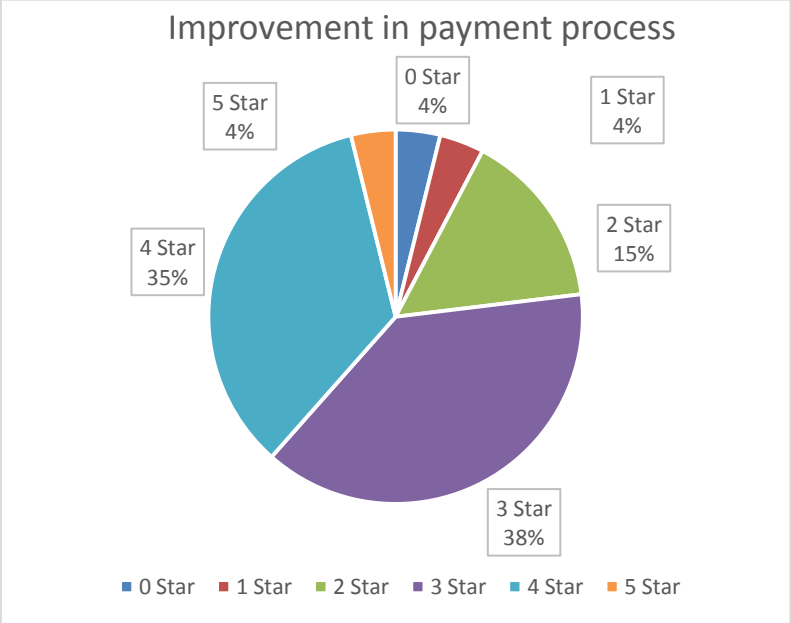
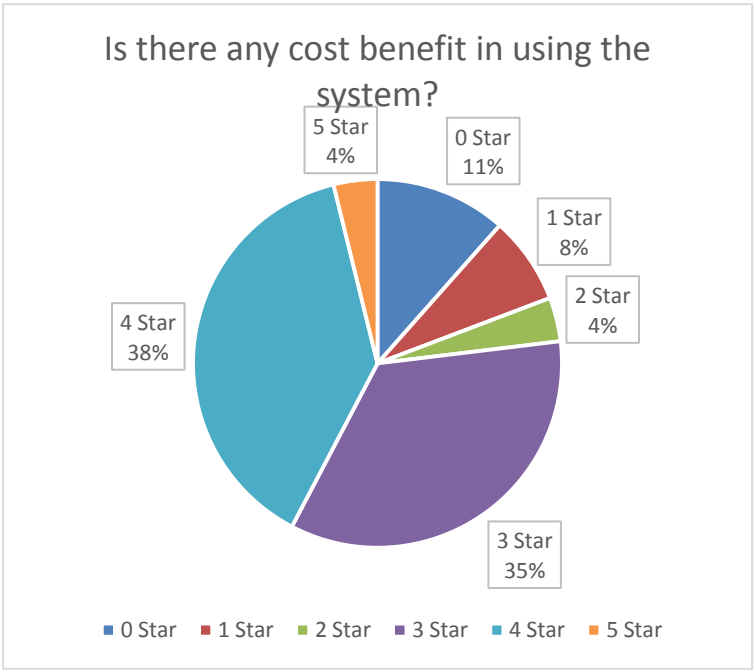


Figure 19: Primary Analysis of PDMS on Improvement in Payment Process (Economic)
(Source: IIPA Primary Research Analysis)

b. Cost-Benefit

Primary research analysis has derived that 42% of respondents rate it collectively 'very high and high i.e. 5 and 4 stars'. As per 35% of respondents, cost benefits are moderate and 23% consider it low on this parameter with rating less than '3 stars' (Figure 20).



Survey outcomes on the cost-benefit are encouraging for PDMS as compared to the earlier manual system. As study has depicted itself to be a beneficial system for all the stakeholders because:

- Efficiency has increased
- Less manpower has been utilised
- Enabling the road cutting requests less prone to cost & time over runs
- Processing time has improved

Figure 20: Primary Analysis of PDMS on Cost Benefit (Economic)
(Source: IIPA Primary Research Analysis)

4.2.3 Operational/Organisational Parameters

Operational/organisational parameters are the most important parameters to judge, as they are driving forces of the system. Operational/organisational parameters are divided further as given below:

1. Brings transparency
2. Easier to use
3. Efficient
4. Reliable
5. Effective
6. Useful

With respect to identified parameters, the system was analysed on number of applications, processing time of applications, reduction in manpower used and number of complaints received by the respective agencies. The summarised primary analysis of these operational/ organizational parameters made the study more holistic in its nature (Table 14).

Table 14: Summarized Primary Analysis of PDMS on Operational/Organisational Parameters

S No	Parameters	User Rating (Max score of 5)		Impact		
		Road Cutting	Road Owning	Road Cutting	Road Owning	Primary Findings
3	**Operational/ Organisational**					
3.1	Brings transparency	3.8	3.75	High	High	100% of respondents believe that the system brings transparency and around 70% of them rated it 'very high as in 5 stars' on this parameter. Inclusion and integration of road owning agencies which are presently not being included was also emphasized. More user centric reports and dashboards should be facilitated.
3.2	Easier to use	3.95	3.25	High	Average	69% of respondents have rated it on '4 stars' and '5 stars' for ease of use. 31% of respondents have rated it on '2 star'. Majority of them found the system easier to use. Various

						technical concerns were raised by the respondents.
3.3	Efficient	4	3.75	High	High	73% of respondents rated it 'high' on efficiency. They stated that jobs are getting done faster and with fewer errors.
3.4	Reliable	3.85	4	High	High	80% of respondents voted it 'very high or high' for reliability which depicts that PDMS succeeded in bringing reliability over manual system.
3.5	Effective	3.85	4	High	High	Majority of respondents have rated system very high on this parameter. System support is very good from the technical team. But the whole technical knowledge is lying with few individuals and this creates a very high risk for future proceedings.
3.6	Useful	4.5	4	Very High	High	92% of respondents have rated it '5 and 4 stars'. This showed that the system was badly needed by the stakeholders and it is definitely serving its purpose.
3.7	No of applications (Improvement)	75% say more than 50%	100% say more than 50%	Very High	Very High	More than 75% of respondents felt that the drastic improvement in applications processing has achieved.
3.8	Processing time (Improvement)	79% say more than 50%	75% say between 10-25%	Very High	Low	Almost all respondents agreed and appreciated the fact that the system has reduced the multiple trips to the

						office and there is a considerable jump in processing time. More than 75% of respondents from road cutting agencies have considered it 'more than 50% improvement'. But road owning agencies gave it a low rating with an improvement of '10-25%'. It is noted that processing time of emergency cases has been taking too long.
3.9	No of complaints Received (Reduction)	56% say more than 50%, But 31% say only between 25-50%	100% say only 25-50%	Very High	High	More than 75% of respondents responded that there is an improvement of more than 25%. It was also appreciated for availability of 'Users' Manual' for technical guidance support. Technical team was considered effective in resolving the queries. Need of an active call centre setup was highlighted.
3.10	Use of manpower		50% say more than 50%			73% of the respondents described that there has been a reduction in use of manpower at least 25-50% at their respective ends hence boosting the organisational performance.

User Remarks

1. Remarkable improvement in time reduction and further it can be reduced if 100% cooperation is given by ROA and allied staff with responsibility.
2. Earlier this used to take 25-30 days and now this has been reduced to 3-4 days on average for a single application process.
3. DDA, DSIIDC, NHAI etc. Should be approached for inclusion in the system.
4. The payment for the small digging was done in three days. However, ROW civic agency does not allow to rectify the faults in existing cables until permission through

PDMS is generated which is causing backlog of faults in existing cables.
5. Suggestion for review of process of digging/cutting for urgent faults up to 10 meters.
6. Risk of missing of application /documents is almost nil after the development of PDMS.
7. Before PDMS the concerned Electrical Maintenance department used to submit an undertaking to ROA and rectify the fault.
8. Permission may be granted for more than one month as required by RCA.
9. There is a need for joint inspection of site by RCA & ROA and these two agencies must be in touch online for faster response, so that permission time can be reduced.
10. Lane owning agency may construct a tunnel on both sides of roads and the agency may lay the service cable in the tunnel

Recommendations

1. Mechanism to avoid technical resources redundancy need to be built and the management need to plan for the horizontal capacity building and change management programmes.
2. Technical Support System should be strengthened and a dedicated call centre may be set up.
3. Communication channels such as SMS and emails should be used for notifications and approvals. Organization process should be initiated to accomplish the same.
4. Inclusion of anticipated agencies (road owning and cutting as well) may be encouraged.
5. Internal working and approval related to road cutting/digging permissions should be part of the same system. Internal workflow should be approved and put in technology for use.
6. Process for emergency faults/repairs should be automated with a provision to pay later with a request by a senior official-in-charge. Need to define an expedited mechanism process and approval for the same.
7. The processes and technical implementations need the management approvals hence a management committee should be constituted that can provide approval and guidance in such matters which respondents are putting as change requests.
8. Need more workshops and engagement program for both road cutting and road owning agencies.

(Source: Primary Research Analysis conducted on the basis of data collected through round table discussions on PDMS with all the stakeholders held at Dept. of IT, GNCTD, on Jan 10, 2018)

Perception of Road Cutting Agencies on Operational/Organisational Parameters

PDMS has been rated 'very high' on usefulness and 'high' on providing transparency by road cutting agencies. On efficiency, effectiveness and reliability, PDMS has been rated 'high' by majority (Figure 21).

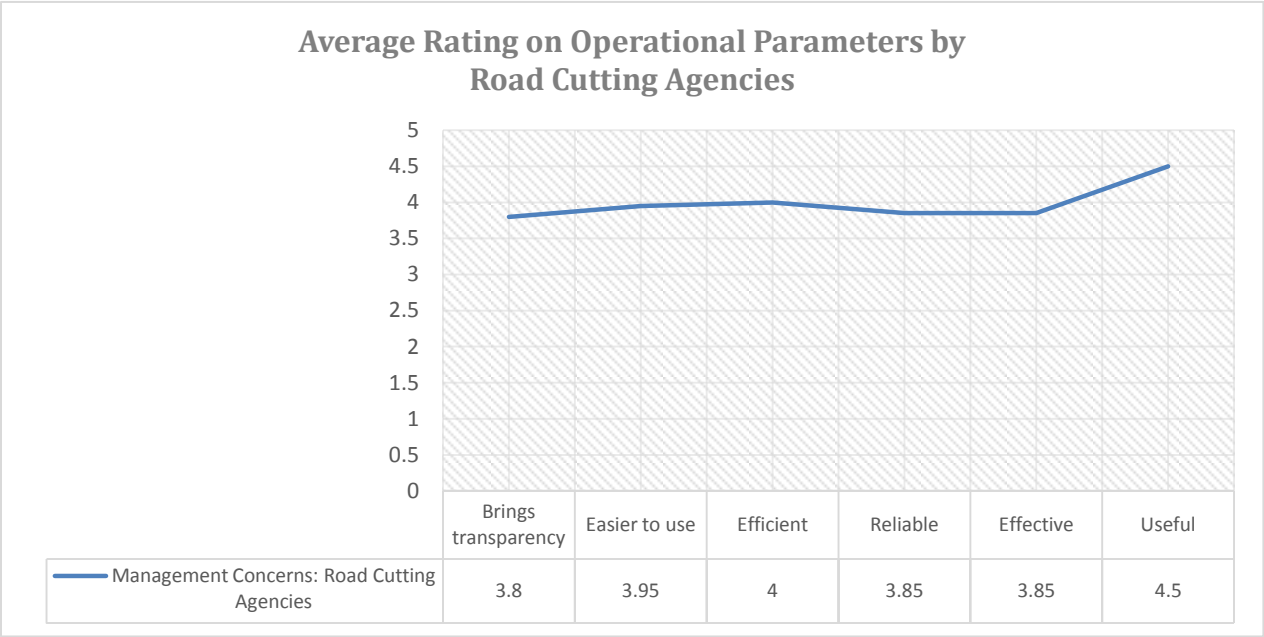
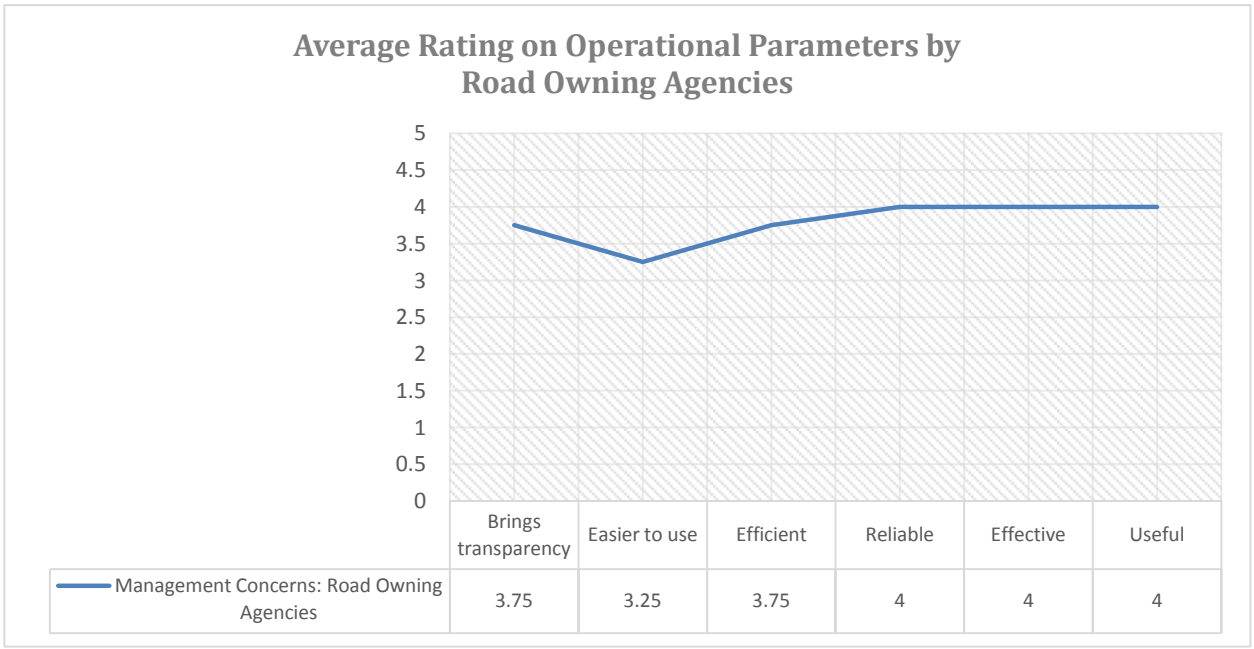


Figure 21: Primary Analysis of PDMS on Operational/Organisational parameters from RCA's perspective

(Source: IIPA Primary Research Analysis)

Perception of Road Owning Agencies on Operational/Organisational Parameters

A flat line was noted on the operational/ organizational parameters i.e., reliability, effectiveness and usefulness depicting the rating 'very high and high' when perception of road owning agencies was analysed. Ease of use, efficiency and transparency were also considered as of 'high' impact by the road owning agencies



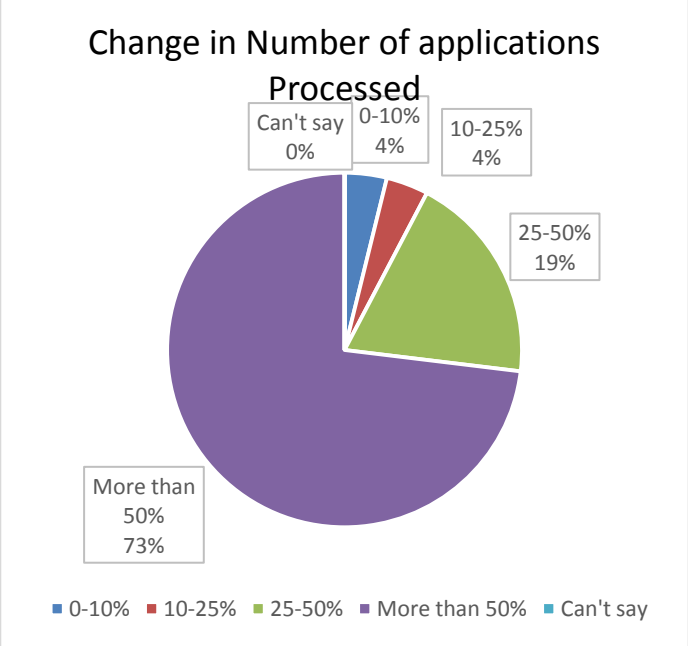
(Figure 22).

Figure 22: Primary Analysis of PDMS on Operational/Organisational parameters from ROA's perspective

(Source: IIPA Primary Research Analysis)

Analysis of Identified Operational/Organizational Parameters

The crux of the study with related parameters was chosen carefully and woven into a survey form. The identified parameters were studied to bring out the micro analysis of PDMS in operational / organizational aspect.



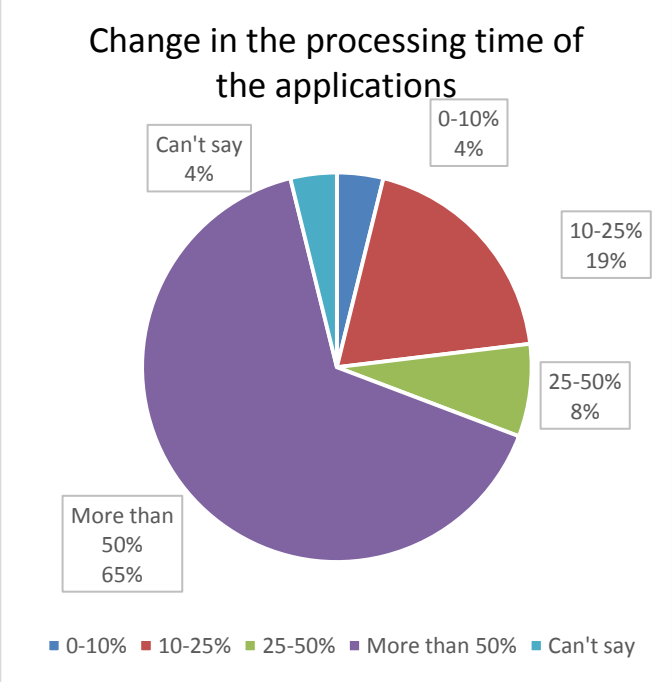
a. Number of applications processed for permission

One of the first factors captured in operational/organizational parameters was 'change in the number of applications processed'. 73% of respondents responded by saying that the improvement was 'More than 50%', 19% marked their responses to 'between 25-50%' improvement, and 4% respondents to '10 to 25%' and 'below 10%' (Figure 23). Respondents in majority were of opinion that the system has definitely improved on processing of applications.

The processes were considered system driven and independent by the respondents which further helped them to avoid bureaucratic hurdles and with few chances of errors.

Figure 23: Primary Analysis of PDMS on Number of applications for permission (Operational)

(Source: IIPA Primary Research Analysis)

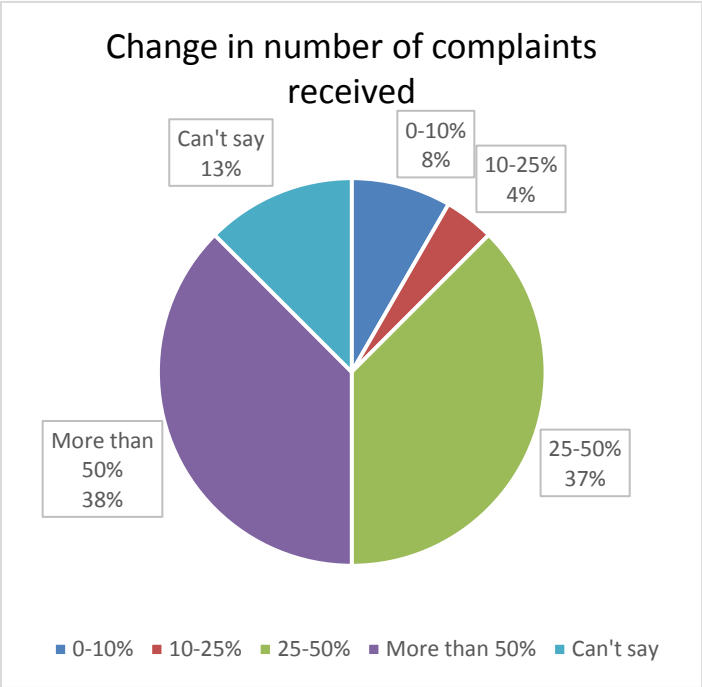


b. Processing time of applications

'Processing time of applications' was another factor highlighted by respondents on which system has done well. Almost all the respondents agreed the fact that the system has reduced the multiple trips to respective offices and with a considerable jump in processing time. The analysis further depicts that, 65% of respondents responded by saying that the improvement was 'More than 50%', 8% of them responded to 'between 25-50%', 19% of them to '10 to 25%'. A small number of respondents (4%) could not decide on this aspect (Figure 24).

During f2f interviews, some of respondents said that the earlier system used to take 25-30 days for processing the applications whereas PDMS has reduced it to 3-4 days (on average).

Figure 24: Primary Analysis of PDMS on processing time of applications (Operational)
(Source: IIPA Primary Research Analysis)



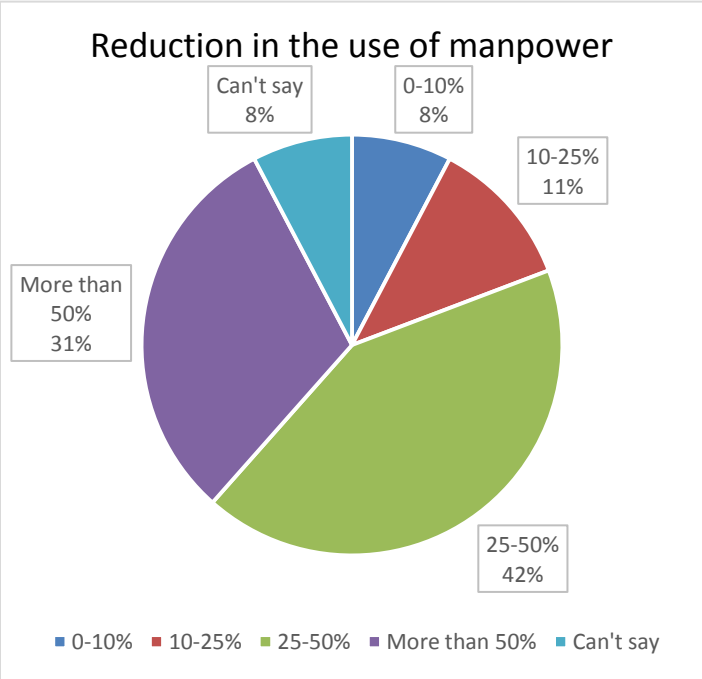
c. Number of complaints received

Number of complaints received against a process is another bench mark to test an application. It was observed that earlier there were numerous complaints were raise by the cutting agencies. In the primary research 38% of the respondents believed that the improvement in this area is 'more than 50%'; 37% of them reverted to 'between 25-50%' '10 to 25%' by 4% of the respondents. 13% of the respondents were unable to decide about this aspect (Figure 25).

Figure 25: Primary Analysis of PDMS on Number of complaints received (Operational)
(Source: IIPA Primary Research Analysis)

It was suggested that a proactive escalation mechanism to deal with the complaints/suggestions received online need to be put in place. Numbers of complaints were observed less from citizens due to lack of awareness.

d. Use of manpower



In primary survey it was observed that 31% of the respondents believed that the reduction in the use of manpower has improved to 'more than 50%', but 42% of them said it be only 'between 25-50%' while 11% of the respondents kept it at '10 to 25%', and 8% of them to 'as below 10%'. 8% of respondents could not quantify it (Figure 26).

Respondents had different views on the use of manpower or the optimization in the human resources. It was highlighted that manual system was engaging more manpower resulting into wastage of resources and respective time. PDMS has made the system online

and accessible through the computers; reducing the overall manual efforts.

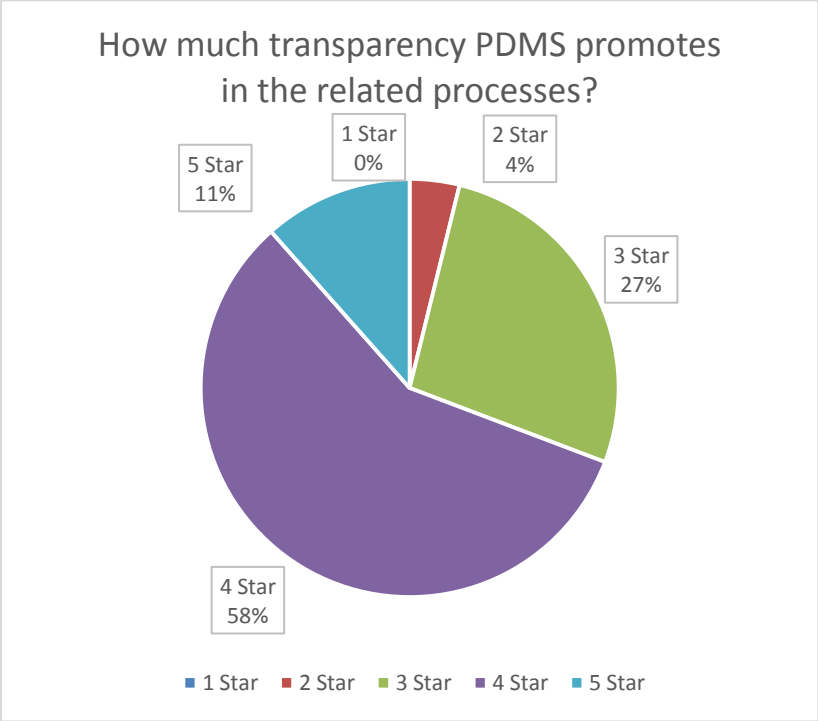
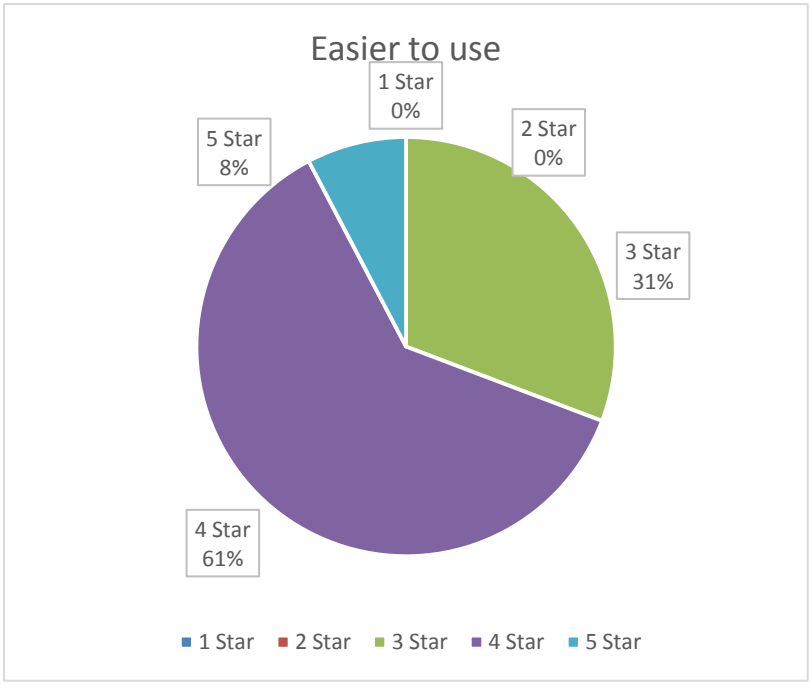


Figure 26: Primary Analysis of PDMS on Use of manpower (Organizational)
(Source: IIPA Primary Research Analysis)

e. Promoting transparency

11% of respondents have given it a rating of '5 stars', a majority 58% of the respondents have rated it on '4 stars' which clearly described the amount of transparency PDMS has brought. Further, 27% of the respondents given it a rating of '3 stars' and 4% respondent rated it on 2 stars. Around 70% of respondents have rated it high or very high on bringing transparency. (Figure 27)

Figure 27: Primary Analysis of PDMS on Promoting Transparency (Organizational)
(Source: IIPA Primary Research Analysis)



Transparency was one of the direct outcomes of the PDMS system. Respondents affirmed that PDMS has helped them in avoiding loss of data/files, payment discrepancies and related concerns. Further, they also mentioned the enhancements for better results.

f. PDMS on ease of use of functionality

When PDMS was analysed on ease of its usage of functionality, 8% of the respondents rated it on '5 stars', a majority of 61%

respondents gave it '4 stars' while, 31% rated it on '3 stars'. Apart from few operational and technical concerns, respondents seemed to be easily acquainted with the system (Figure 28).

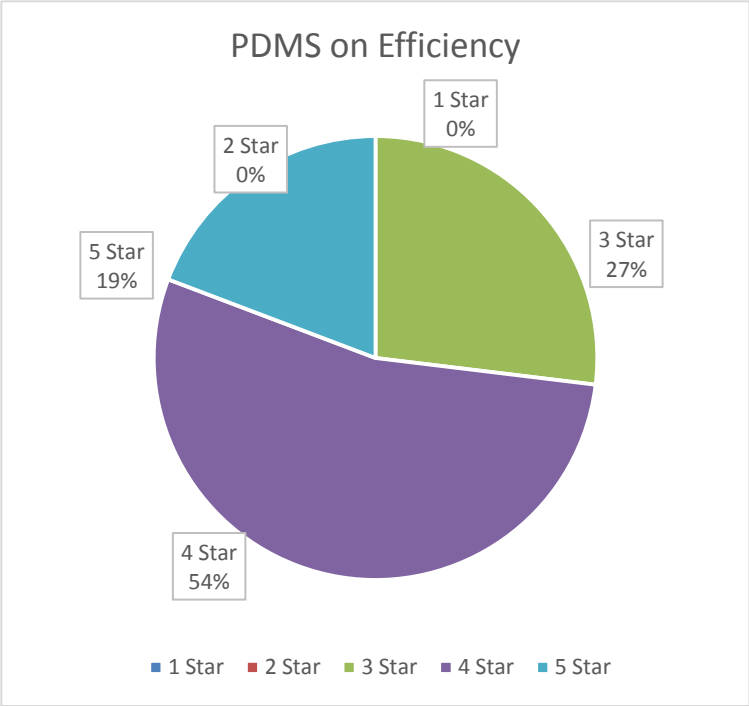


Figure 28: Primary Analysis of PDMS on ease of use of functionality (Operational)
(Source: IIPA Primary Research Analysis)

g. PDMS Efficiency

Primary survey results are encouraging on efficiency as 73% of respondents are very much satisfied with the efficiency of the system (bay rating it on '5 and 4 stars collectively). 27% of the respondents seemed to be moderately satisfied ('3 stars') with the system (Figure 29).

Efficiency is one more area where PDMS has scored well. Respondents stated that they have been able to do their job faster and with fewer errors. Efficiency is a key factor as the work involves multiple stakeholders. Citizenry is directly impacted with the inefficiency of road cutting/digging works in day to day life. Related agencies and organizations can bring in more process efficiency through PDMS.

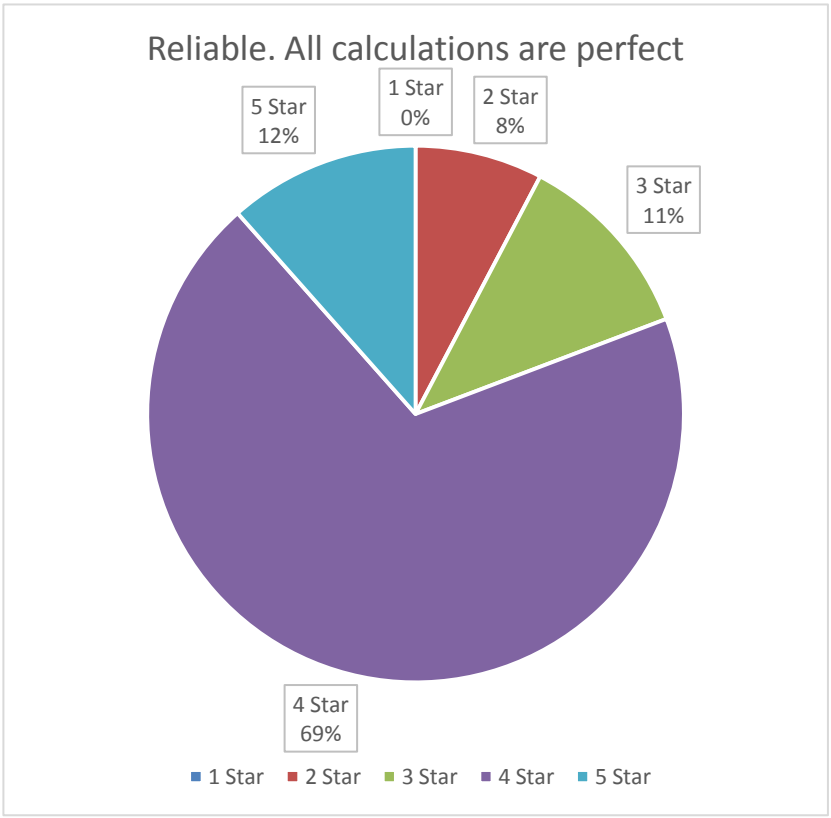


Figure 29: Primary Analysis of PDMS on efficiency (Operational)
(Source: IIPA Primary Research Analysis)

h. PDMS reliability

The primary research analysis brought out that 81% of the respondents considered PDMS to be a very reliable system by rating it collectively on '4 and 5 stars'. Very low percentage of the respondents disagreed on PDMS being reliable (Figure 30).

Further, PDMS came out excellent on reliability. A reliable system builds right kind of trust among stakeholders and stays long term. It was also discussed that more relate agencies need

to be engaged for better coordination such as traffic police etc.

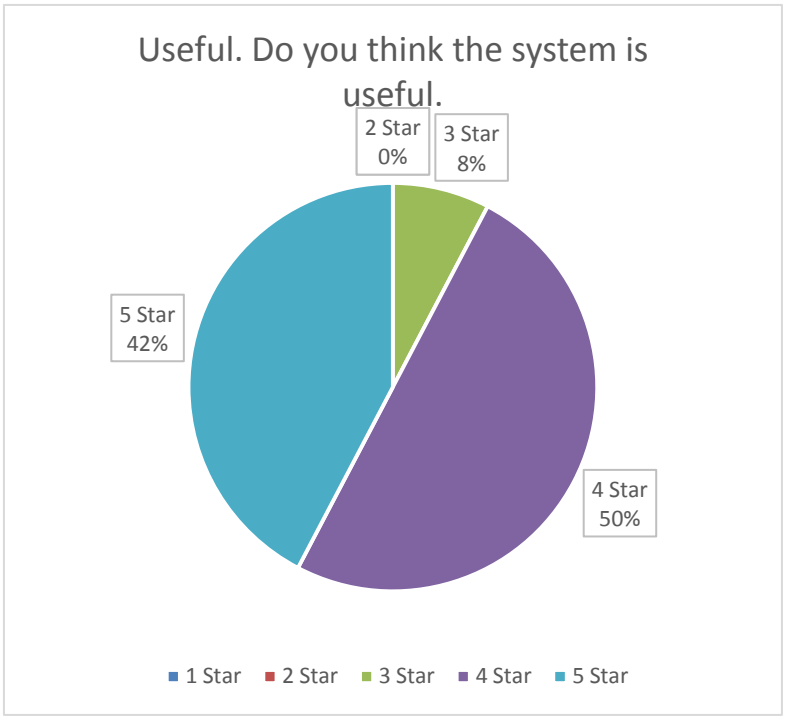
Figure 30: Primary Analysis of PDMS on reliability (Operational)
(Source: IIPA Primary Research Analysis)

i. PDMS as 'An effective and productive system'

Survey showed that 81% of respondents considered it very effective and high on productivity. 11% of respondents considered it moderately effective. 8% of respondents were not satisfied with the affectivity of the application (Figure 31).

An online shift from manual system made the user of system more effective and productive. Respondents have rated system on a very high scale for this parameter.

Figure 31: Primary Analysis of PDMS on an effective and productive system (Operational)
(Source: IIPA Primary Research Analysis)



j. PDMS as 'A useful system'

Usefulness of the system in the study rated the best as per the respondents. 92% respondents considered it a very useful system and only 8% of respondents said that they were moderately satisfied. The results proved that the system was badly needed by the stakeholders and it is definitely serving its purpose (Figure 32).

Usefulness is one of the crucial of study and PDMS survey resulted excellent on analysis. During the

interviews also, respondents appreciated its usefulness.

It serves the interests of all the stakeholders including road owning agencies, road cutting/digging agencies, and other organizations who are directly affected by the road cutting/digging and citizens as well.

Figure 32: Primary Analysis of PDMS on a useful system (Operational)
(Source: IIPA Primary Research Analysis)

4.2.4 Social Parameters

Another major parameter where the study focussed was social aspects of PDMS. Citizens being one of the stakeholders, the system was analysed with attributes such as information availability to take quick decisions, reports and status generated through PDMS, and communications through feedback or grievances. A summarised analysis of these parameters as also be carried out herein (Table 15). Such attributes were considered as they intend to empower the citizens by endowing the participation in governance, which are information, feedback, complaints & grievances and communications.

Table 15: Summarized Primary Analysis of PDMS on Social Parameters

S No	Parameters	User Rating (Max score of 5)		Impact		
		Road Cutting	Road Owning	Road Cutting	Road Owning	Primary Findings
4	**Social**					
4.1	Information	3.75	4	High	High	A very large respondents' base of 79% has voted 'high and very high' on information parameter. 21% of the respondents still considered it average and less.
4.2	Feedback	3.3	3.5	Average	High	For this parameter, 63% of the respondents voted 'high and very high'. 25% of respondents still considered it as 'average' whereas 12% of them considered it poor on this parameter.
4.3	Complaints & Grievances	3.2	3.75	Average	High	This area has demanded attention for further enhancements as only 37% of the respondents were satisfied with this feature, while 46% of them are moderately satisfied and given it a rating of 3 stars. 17% of respondents are not satisfied with complaint management by PDMS.

4.4	Communications	3.25	3.25	Average	Average	As very few i.e. 4% of respondents have given it a rating of 5 stars, 42% have given it 4 stars, 29% given it a rating of 3 stars, 25% have given 2 stars which depicted that PDMS might need to strengthen the communications area of the system.

User Remarks

1. During the interactive session, road cutting agencies wanted more responses to their feedbacks. Surprisingly some of the feedbacks and suggestions were already implemented and some were going live in a few days.
2. While interviewing respondents have praised the system but side by side raised some issues. These issues are not logged in the system and they have reported them informally. Sometimes issues are resolved but there is no status update on the same.

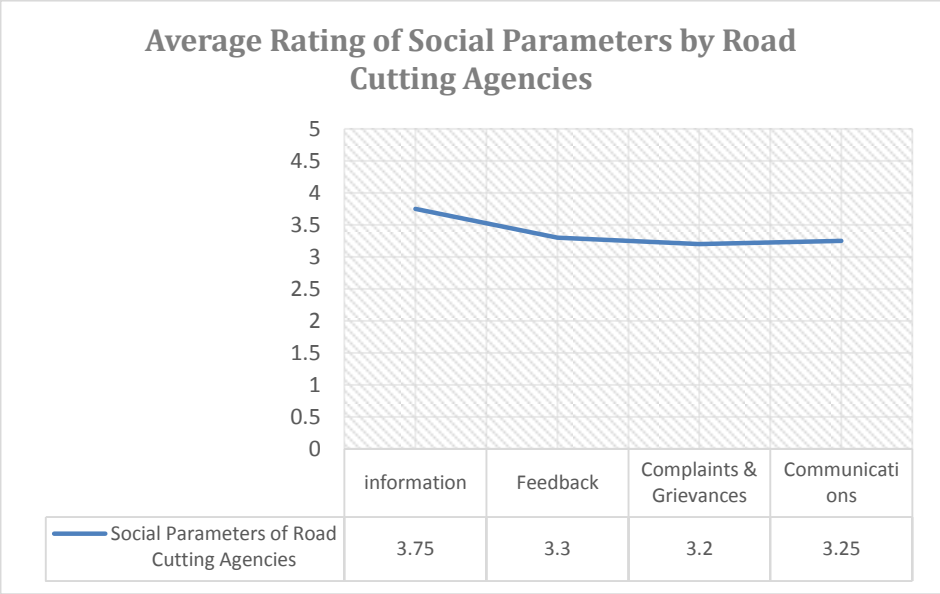
Recommendations

1. Information dashboards should have search functionality and filters as well.
2. Present feedback mechanism may be revamped with a proper action plan and timelines.
3. An advanced mechanism to monitor and manage the grievances along with receptive escalation mechanism should be incorporated.
4. Call centre availability, capacity building and infrastructure are the areas where PDMS must engage its efforts immediately.
5. A ticket based complaints system is recommended.
6. Respondents and citizen wants the interaction to be conversational and human, a chatbot kind of interface can also be thought about.

(Source: Primary Research Analysis conducted on the basis of data collected through round table discussions on PDMS with all the stakeholders held at Dept. of IT, GNCTD, on Jan 10, 2018)

Perception of Road Cutting Agencies on Social Parameters

Data gathered through survey stated that road cutting agencies have rated 'high' on 'information' aspect whereas 'feedback, complaints and communications' were rated on 'average' which clearly indicated that road cutting agencies needed strengthened

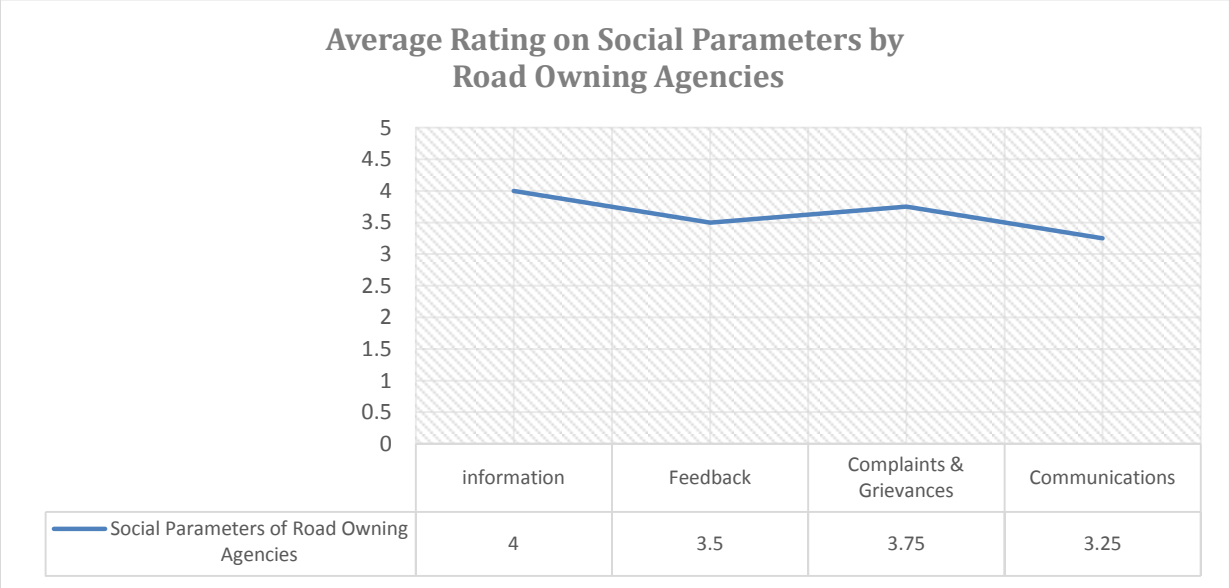


communication and support system from PDMS (Figure 33).

Figure 33: Primary Analysis of PDMS on Social Parameters from RCA's perspective
(Source: IIPA Primary Research Analysis)

Perception of Road Owning Agencies on Social Parameters

This is an area of concerns and needs improvement from road owning agencies point of view also. On information, feedback and complaints, they have given it a high rating but on communication they have given it an average rating (Figure 34).



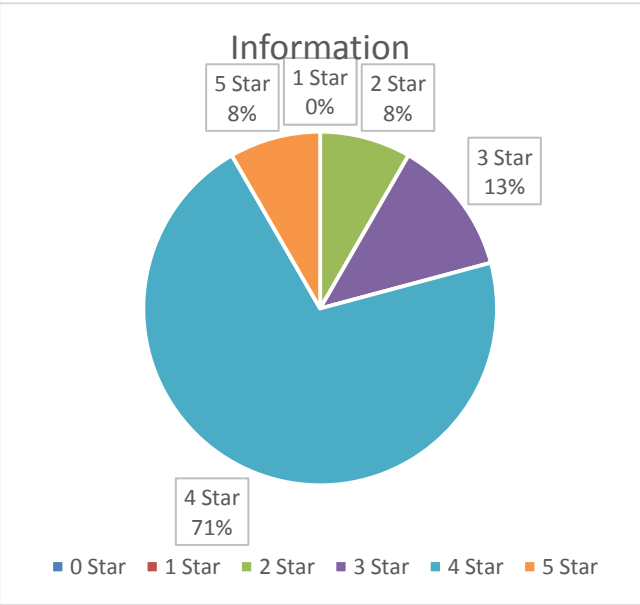


Figure 34: Primary Analysis of PDMS on Social Parameters from ROA's perspective
(Source: IIPA Primary Research Analysis)

Analysis of Identified Social Parameters

Survey was conducted on 4 basic parameters of citizen empowerment; information availability and sharing, mechanism for feedback & suggestions, grievances capture & management and communication channels implementation & their reliability.

a. Information

A very large user base of 79% has voted high and very high on information parameter. 21% of respondents still consider it average and less. If some of these suggestions are implemented, the application will be excellent

on information sharing (Figure 35).

As information availability and sharing is one of the cornerstones of any e-governance implementation and is a basic social parameter. Respondents have rated PDMS well on this parameter. Improvement in visual designs and display of precise data sets were also communicated in the focus group discussions.

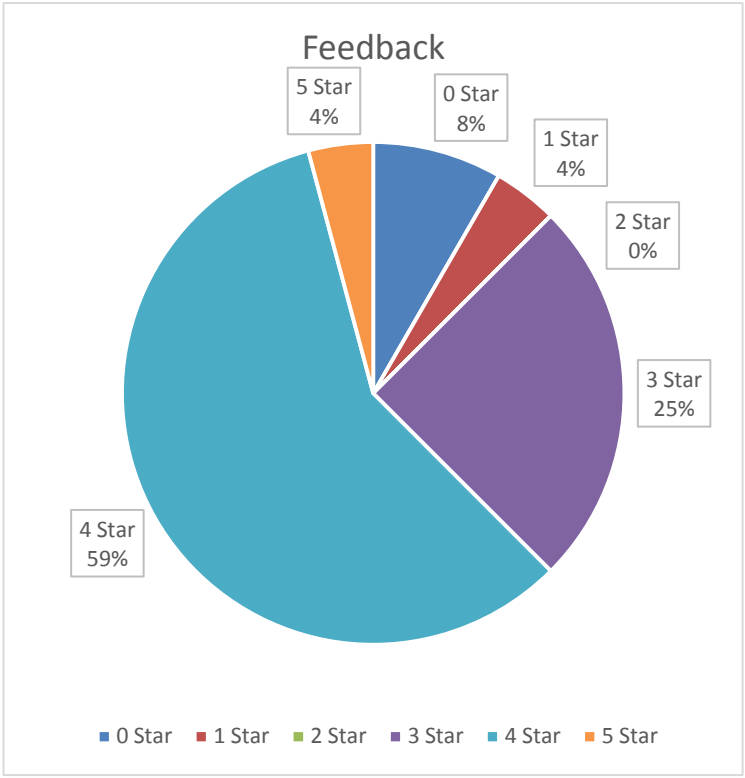


Figure 35: Primary Analysis of PDMS on Access to Information (Social)
(Source: IIPA Primary Research Analysis)

b. Feedback

Primary study results showed that 63% respondents have voted high and very high and seemed to be satisfied on feedback parameter. 25% respondents still considered it on 'average'. 12% of them considered it 'low' and 'not satisfied' on this parameter (Figure 36).

Analysis on feedback mechanisms it was brought out by respondents that an active and timely response to their feedback/ suggestion should be ensured. Apparently, the concern of communication interstices was also highlighted.

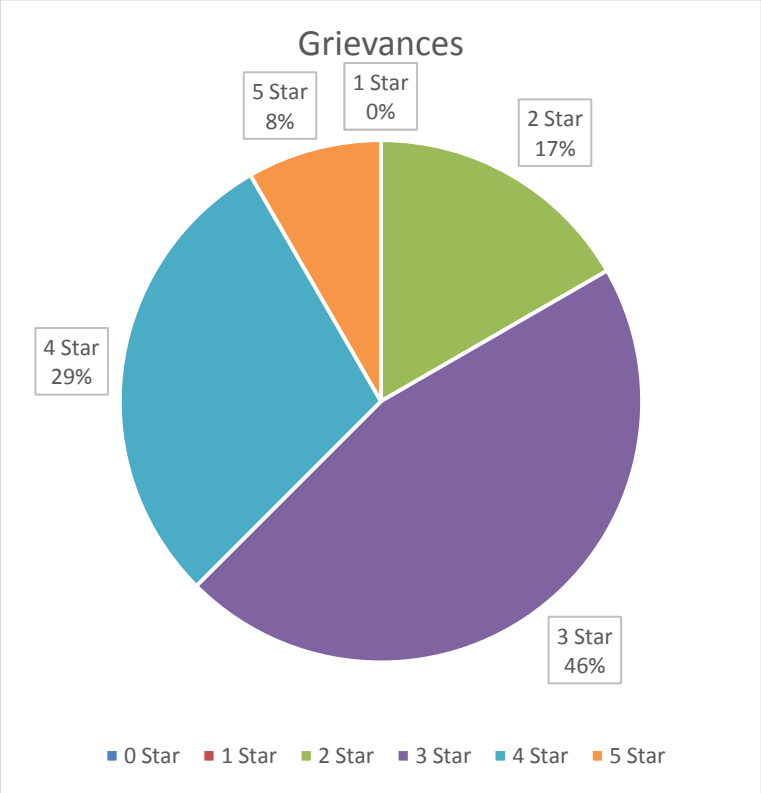
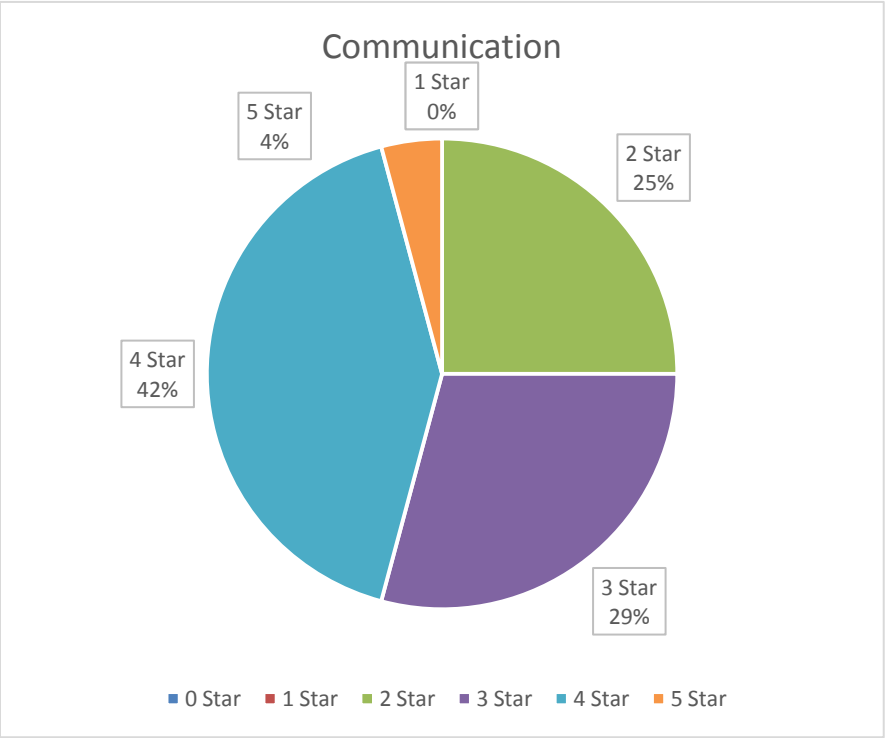


Figure 36: Primary Analysis of PDMS on Feedback System (Social).
(Source: IIPA Primary Research Analysis)

c. Complaints and Grievances

In the primary study 37% of the respondents were satisfied with the collective rating of ' 4 and 5 stars', 46% of them were moderately satisfied and given it a rating of '3 stars'. 17% of respondents are not satisfied with complaint management (Figure 36). When we studied the system, there was a definite decrease in number of complaints and grievances



(Source: IIPA Primary Research Analysis)

resolved. System has a mechanism of capturing complaints and grievances but it seemed not many complaints were received. While interviewing respondents, it was observed that concerns raised by them were not being logged in the system which respondents had reported informally (Figure 37).

Figure 37: Primary Analysis of PDMS on Complaints & Grievances Redressal (Social)

d. Communications

As per primary research findings 46% of respondents were satisfied on this parameter with rating of '4 and 5 stars'. 29% of them were moderately satisfied and 25% of them noted their dissatisfaction. As can be seen from the data, respondents have more expectation from this medium. Communication wing need to more prompt and responsive (Figure 38).

Figure 38: Primary Analysis of PDMS on Communications (Social).
(Source: IIPA Primary Research Analysis)

Communication with stakeholders and citizens has been a crucial aspect in social and the study analysed it on available channels, quality of communication and stakeholder satisfaction on communications. Further the study revealed that, PDMS has SMS, email and phone as primary communication channels along with a call centre for technical support, feedbacks and complaints. Enhancement in areas like proactive call centre availability, capacity building and infrastructure for strengthened communication was observed through this study of social aspects.

Summary

After the intense primary research conducted through multiple interaction rounds with stakeholders, round tables, f2f interview and survey on PDMS, numerous crucial observations have been derived. Primary research tool enabled the research

and analysis on the basis of TEOS framework and understanding the perception of road cutting and owning agencies along with citizens. The key outcomes derived from this primary analysis are:

- The basic impact assessment of PDMS portrayed its increasing adaptability, usage and processing. It clearly stated that, within one year PDMS has managed to efficiently function with its boost in number of requests received, processed and registered users.
- Further, the analysis based on TEOS parameters which also illustrated the perception of both the agencies road cutting and road owning has also brought numerous crucial observations herein.
- On technical parameters PDMS has been achieved an average score of more than 3.5 on a scale of 5. The perception of both road cutting and owning agencies was also considered on the parameters such as 'ease of use', 'security and robustness', 'easy reports' and 'GIS Utilities'.
- On economic parameters, PDMS has scored nearly at 3.25 out 5 on an average which makes it a moderate performer in economic aspects. Both agencies road owning and cutting did not observe any cost-benefit through PDMS. Further, improvement in payment process was also analysed.
- On operational/organisational front PDMS has seemed to thrive for the value addition in the system by encouraging efforts on efficiency, reliability and usefulness, transparency, processing of requests, time taken for processing etc. Crucial stakeholders have appreciated the system for bringing increased transparency, reliability, efficiency and accountability. On an average, PDMS has been scored more than 3.5 out of 5 when operational/ organisational aspects are concerned.
- PDMS has been rated fairly well by the respondents from road owning and cutting agencies for social aspects it has acquired in its scope. Availability of information and access to it, an effective feedback & suggestions system, complaints & grievances and communications were the parameters which were studied here. With the average score of more than 3.5 out of 5, PDMS has brought an upside scope for augmenting the aspects such as strengthened and proactive support system, responsive feedback mechanism, well organised and simpler data presentation and accessibility.

Subsequent section incorporates the future enhancements, recommendations and way forward for PDMS to be a more robust and fully equipped system.

5. Conclusive Remarks

Chapter Overview

This chapter integrates all the recommendations on crucial concerns related to PDMS implementation and execution. Presuming PDMS is indispensable; various recommendations for enhancing its usage and affectivity have been presented herein. Before moving on to the future enhancements and recommendations, the chapter also covers the present scenario of PDMS with its kernel characteristics (Section 5.1). 'PDMS in Future' – this section covers the way forward for important facets of infrastructure, technical, operational, GIS, payments, capacity building and support enhancement are elaborated (Section 5.2). Finally, the concluding remarks sums up the learning from the study.

5.1 PDMS at Present

Plan, Dig and Monitor System (PDMS) the unique initiative of GNCTD integrated with spatial technologies and GIS maps has set its benchmark in the niche area of governance for issuing online permissions for road cutting/ digging request by respective agencies. It has instilled the efforts for process reformation through optimal Government Process Reengineering (GPR) as well. PDMS has administered the increase in its adoption, usage and functionality in just one year of genesis. Given that PDMS has been the first of its kind initiative in a diverse and distributed state like Delhi, PDMS has paved its way with following characteristics:

- **Faceless**: PDMS eluded the manual process making it an adhoc system which interacts node to node electronically.
- **Cashless**: Provision of electronic payment made it an advanced application with improved expediency and encouraging digital transactions.
- **Paperless**: The optimal process reformation and standardisation has made PDMS to be a paperless service delivery platform.
- **GIS 3D Maps**: Multilayered GIS 3D Maps is the unique utility offered by PDMS while requesting for road cutting for accuracy.
- **100% Acceptance**: PDMS is the only system used for road cutting/digging permissions in the territory of Delhi and there is no alternate process in practice by Government of NCT of Delhi.
- **Very high stakeholder satisfaction**: Both RCAs and ROAs are very much satisfied with the initiative and very eager to participate & contribute.
- **Innovative**: Better decisions and inter-agency collaboration by using existing GIS infrastructure of Govt of Delhi with high resolution 3D maps and utility layers. This project is a good example on reaping the harvest of earlier investments.

5.2 PDMS in Future

PDMS, with its increasing efficiency has created advancement of scope in its overall functioning and activities, to engage the ROAs and RCAs through the portal. To ensure effective implementation of all the proposed enhancements and refinements to PDMS, the existing institutional framework in terms of Infrastructure, Human Resource and extended Technical Support must be expanded with respect to the future requirements' analysis.

In order to support the scale at which PDMS is growing, it is required to incur greater resources to manage the operational, organisational and technical expansion. With a comprehensive approach that takes into account effective up gradation of PDMS, the following spheres have been identified for enhancement along with the justification of use:

- **Infrastructure:** On the infrastructure facet of PDMS, it requires a disaster recovery site for backup and recovery. Business continuity documentation should be done and implemented; presently, it is in rudimentary stage. Source Code versioning and backup system is required for the safe-guarding of source code. A mechanism for step-wise retrieval of source code has to be implemented. To ensure a seamless experience for the users on the website, PDMS needs to have 24*7 Monitoring Support resources.
- **Technical:** Web application should be responsive so that it can be seen on different resolutions and devices i.e. mobiles. Dashboards and reports need to be fragmented role based with precise and simple datasets and appropriate filters. Techniques to export the reports and dashboards in excel or csv files should be facilitated. Control of profile and request modifications should also be relinquished to the respective organizations/users.
- **GIS and Mapping:** MS Silverlight which is obsolete presently can be replaced by some other advanced independent utility for the use of GIS feature. The process of developing GIS utility on other programming platforms such as 'Java' has to be expedited. GIS and mapping need more work on up gradation of maps with new boundaries and streets. Some streets cannot be marked on the map. Street name layer should be made active, so users can see the milestones easily. Give zoom facility in the map, users should be able to zoom while drawing, accurately.
- **Advanced Payment Interfaces:** More electronic payment gateways should be integrated in order to strengthen the existing e-payment utility. Prompt alert systems and status updates related payments should be deployed. Cancellation and Refund Policy should also be facilitated.
- **Change Management and Capacity Building:** In order to keep the PDMS team abreast with agile service delivery practices and new developments in the field, periodic skill up gradation and research related to similar practices and initiatives including national/ international – a proficient team deployment is necessary. Management need to plan the technical capacity building of the organization on PDMS. Workshops and training programs should be an ongoing activity. More stakeholders should be trained on the system. Call centre and help desk team should be trained on operational and technical aspects.
- **Processes:** Considering the PDMS's G2G and G2B nature of application, a lot of processes needs modifications and reengineering. A committee should be

constituted and empowered to implement the changes in the application. These changes will require policy level, finance level or administration level approvals. This committee will help in expediting the process. Some process that needs immediate attentions are, dealing with emergency cases, existing cable repair, payment adjustment or refund in different scenarios processes for the complete cycle of Feedback, suggestions and complaint along with the escalation management etc.

- **Self-sustainability Model:** Since at present, PDMS is completely dependent upon funds incurred from the operational fees while at the same time enhancing and managing the technical and operational/organisational aspects, a fostered self-sustaining revenue model may be deployed.
- **Help Desk and Call Centre**: Dedicated help desk for technical support should be deployed which can extend email or ticket based support system.
- **Promotion and Awareness Campaigns:** PDMS can be publicized in innovative manners being a unique initiative of e-governance.
- **Enterprise Architecture:** PDMS in its prospective policy can enable 'Enterprise Architecture' through high level process mapping within the governing agencies.
- **Collaboration:** Other road owning agencies in the territory of GNCTD (e.g. DDA, DSIIDC, and NHAI) could also be approached for getting connected with PDMS, subject to their respective administrative constraints. Though it is more of an administrative suggestion, nevertheless if implemented, it could help the ultimate users of PDMS.
- **Defining and Monitoring KPIs:** The establishment of periodic monitoring and self-assessment mechanisms ensures that any project's performance is on track according to projected forecasts. Development of Key Performance Indicators (KPIs) in various spheres of the PDMS project is apparently an important step that could be undertaken.

Having a host of future activities in the pipeline, PDMS needs to deploy a competent and adequate team, procure advanced state of the art infrastructure and ensure robust technical support to maintain cross-functional coherence among all stakeholders. In order to function as a proactive Independent Business Division in the G2G, G2B and citizen engagement realm, PDMS should be staffed with the suggested expansion in Infrastructure, Human Resource and Technical Support. With the provision of enhanced resources, the future strategy and vision outlined for PDMS is one that can be achieved for ensuring the prevalence of participatory governance as a core pillar of the democratic system of India. This digital platform makes the citizen an agent of change through crowd sourcing and provides an opportunity to contribute in the journey towards nation building.

Appendix I - Survey Questionnaire on PDMS

Dear Sir/Madam,
This questionnaire is part of impact assessment study of PDMS being undertaken at the behest of Delhi State Government. You are kindly requested to spare your valuable time and contribute to the study by filling up this questionnaire. All responses will be kept confidential and will be used only for quantitative analysis.

Thank you for your kind inputs. It would surely help us to not just evaluate PDMS but also help Delhi Government to understand your needs and expectations from PDMS portal.

****

Basic Profile:

1. **Whom do you represent here (tick any one)*:**
   - **(i) Road Cutting Agency :**
   - **(ii) Road Owning Agency :**
   - **(iii) Any Other (Please Specify):**
2. **Name of Agency*:**
3. **Designation*:**
4. **Do you use PDMS yourself : Yes / No**
5. **If Yes, number of months (approx.) you have been using PDMS :**
6. **If No, who uses PDMS on your behalf; his/her designation only :**
   (In case you have not been using PDMS yourself, you may just share your perceptions about the Portal as a citizen)
7. **Your Name :**
8. **Your Contact Number :**
9. **Your Contact email :**

**: Compulsory Fields*

Understanding PDMS

Section- A: Understanding Operational Parameters of PDMS by your perception

1. After the usage of PDMS , how much improvement was found in the number of applications over the previous manual system *(Tick any one; just an approximation by your perception)*

   a. 0-10% Improvement
   b. 10-25% Improvement
   c. 25-50% Improvement
   d. More than 50% Improvement
   e. Can't say

2. After the usage of PDMS , how much reduction in the processing time of the applications was perceived over the previous manual system *(Tick any one; just an approximation by your perception)*
    a. 0-10% Reduction in processing time of the applications
    b. 10-25% Reduction in processing time of the applications
    c. 25-50% Reduction in processing time of the applications
    d. more than 50% Reduction in processing time of the applications
    e. Can't say

3. After the usage of PDMS , how much reduction in number of complaints was perceived by your agency *(Tick any one; just an approximation by your perception)*
    a. 0-10%
    b. 10-25%
    c. 25-50%
    d. more than 50%
    e. Can't say

4. Management Outcomes (*Use 1 to 5 rating to give your preference)*

S No	Rate PDMS on following aspects	1 (no)	2 (low)	3 (average)	4 (high)	5 (very high)
a.	How much transparency PDMS promotes in the related processes?					
b.	How easy is PDMS portal to use?					
c.	Has PDMS made you more Efficient *(i.e. you have been able to do the same job faster)?*					
d.	Has PDMS made you more Effective *(Have you become more productive/result-oriented in the same job after help of PDMS)*					
e.	Is the output of PDMS more Reliable (*Are the computations/ calculations done by PDMS perfect)*					
f.	Do you think this system is useful?					

5. Do you think that the manpower/man-hours that were being used in your work-domain been reduced considerably at your end because of PDMS implementation
(Tick any one; just an approximation by your perception?)
    a. 0-10% reduction
    b. 10-25% reduction
    c. 25-50% reduction
    d. more than 50% reduction
    e. Can't say

Section- B:* Economic Parameters *of PDMS by your perception

S No	Rate the system on following features	1 (no)	2 (low)	3 (average)	4 (high)	5 (very high)
1	Is there any improvement in payment process due to online payment provided by PDMS?					
2	Do you perceive any other cost benefit in using PDMS?					

Section- C:* Technical Interface *of PDMS by your perception

S No	Rate the system on following features	1 (no)	2 (low)	3 (average)	4 (high)	5 (very high)
1	Do you think the screens/dashboard are easy to understand?					
2	How do you feel about the security of your own data/information in PDMS system?					
3	Do you find the reports generated by PDMS easy to understand?					
4	How do you rate the drawing and sharing facility on map of the cutting/digging?					
5	How will you rate the utility maps functionality of the GIS?					
6	Do you think this system is useful?					

20. Did you ever experience any downtime of the PDMS portal in entire duration of the time you have been using it?
    a. 0-1% downtime
    b. 1-5% downtime
    c. 5-10-% downtime
    d. More than 10% downtime

Section- D:* Social Parameters *of PDMS by your perception

21. In what category do you will put the current system (PDMS)
    a. Innovation excellence
    b. Technical excellence
    c. Governance excellence
    d. Stakeholder empowerment
    e. Can't say

S No	Rate the system on following features	1 (no)	2 (low)	3 (average)	4 (high)	5 (very high)
1	Right to information: Visibility of the project and their status					
2	Acceptance of your Feedback / Inputs to improve quality of PDMS, by PDMS team					
3	Grievance Redressal Mechanism: Response to your complaints about					

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