

Chapter II

Project Management





2.1 Project Planning

The K2 project implementation envisaged a single point responsibility for provision of infrastructure, software and maintenance to be entrusted to a System Integrator (SI) to be selected through tendering. Key features of the project structuring included collaborative development of project documents in consultation with the short-listed bidder, bundling of application development, hardware supply and maintenance responsibilities in a single contract, specific service level benchmarks to be monitored by an automated tool and selection of the lowest bidder from the technically qualified bidders.

2.1.1 Selection of System Integrator

The DoT prepared and submitted a Detailed Project Report (DPR) for implementation of the Project. The DPR contained the cost projections for K2, schedule of implementation, expected benefits *etc.* The cost of development and implementation of project for a period of seven years was estimated at ₹90.71 crore. The project was proposed to be funded through Government of India (GoI) funds, 13th Finance Commission Grants and the State Government funds.

DoT invited (October 2009) Expression of Interest (EOI) for shortlisting vendors who were interested in participating in the tender for the implementation and maintenance of the K2 project. In response to this, 13 firms expressed their interest. The eligibility of the bidders was evaluated by the Tender Scrutiny Committee. The Steering and Tender Accepting Authority for K2 considered 10 bidders as eligible for the Request for Proposal (RFP) for K2. In response to the RFP document only seven bids were received as three shortlisted bidders did not opt to respond. After evaluation of the bids, the commercial bids of the six vendors were opened (July 2011). The commercial proposal submitted by M/s TCS was found to be L1 with a total project cost of ₹79.62 crore.

The DoT issued (September 2011) the work order and the MSA was signed between DoT and TCS on 18 October 2011.

The expenditure incurred towards the project as at the end of March 2020 was ₹130 crore which included software development cost, providing infrastructure at treasuries and consultancy charges *etc.*

2.1.2 Cost components of the contract

The MSA was executed with the SI for a contract price of ₹79.62 crore. The accepted financial proposals comprised of the components indicated in **Table 2.1**.

Table 2.1: Components of the contract

(₹ in crore)

Sl. No	Item of Expenditure	Initial Cost	Annual maintenance charges	Total charges
1	Cost for Application Software	11.49	13.89	25.38
2	Cost for IT Infrastructure	21.65	10.62	32.27
3	Cost for System Software <i>etc.</i>	9.26	3.33	12.59
4	Training Cost	1.74	0	1.74
5	Data Migration / Digitisation Costs	0.61	0	0.61
6	Man power costs	0	3.00	3.00
7	Consumable Cost	0.58	3.45	4.03
	Total	45.33	34.29	79.62

Source: Commercial Bid Proposal of TCS

Component-wise cost analysis showed that IT infrastructure which mainly includes procurement of hardware comprised 40 *per cent* of the total cost followed by application software and system software. The expenditure incurred by the SI towards the project as at the end of March 2020 was ₹52.38 crore. The deviations and deficiencies observed during detailed scrutiny of contract management documents are brought out in Paragraph 2.6.

2.2 Project Financial Management

2.2.1 Delay in implementing the project - Loss of central assistance

Under the Mission Mode Project – Treasury Computerisation, GoI would release the central share to the designated State/Union Territory (UT) in three instalments of 40 *per cent*, 30 *per cent* and 30 *per cent* respectively. The States/UTs were required to complete their project in three years and any residual components were allowed to be spilled over into the fourth year. The release of instalments was, however, based on the achievement of stipulated milestones as indicated in **Table 2.2**.

Table 2.2: Statement showing the milestones prescribed for release of central assistance

1 st instalment	<ul style="list-style-type: none"> On submission of the proposal
2 nd instalment	<ul style="list-style-type: none"> Utilisation of the amount released earlier. Purchase or part purchase of hardware/upgradation of hardware. Purchase/development of software. Completion of Business Process Re-engineering (BPR) exercise. E-connectivity (at least through e-mail) between district treasuries and Finance Department of State/UT

	<ul style="list-style-type: none"> • Commencement of training of staff. • Achievement of milestones as per approved plan
3 rd instalment	<ul style="list-style-type: none"> • Utilisation of the amount released earlier and State/UTs' share of 25 <i>per cent</i> • Completion of code amendment exercise. • Demonstrated connectivity with Reserve Bank of India, Accountant General(AG), Controller of Government Accounts and agency banks. • Operationalisation of all the modules in accordance with the guidelines

Source: Mission Mode Project-Treasury Computerisation Guidelines

GoI released (March 2012) ₹9 crore towards first instalment against the proposal of the State for ₹22.50 crore. Further instalments were not released as the State failed to achieve the stipulated milestones. Consequently, the State lost an opportunity of central assistance of ₹13.50 crore.

The Government stated (November 2021) that department had repeatedly requested for release of funds from GoI. Audit observed that as the Business Process Re-Engineering (BPR) exercise of amending the financial codes was not completed, the requirements for central assistance fund releases were not fulfilled even as of March 2021, as brought out in the paragraphs below. The department lost an opportunity to avail the central assistance.

2.3 Mapping of Business Rules

2.3.1 Business Process Re-engineering exercise not undertaken

The guidelines of Mission Mode Project - Treasury Computerisation recognized that large part of the Treasury Computerisation would become possible only after the relevant codes are amended by the State and hence provided for BPR for re-engineering of the existing processes and introduction of new processes where necessary, to ensure synergy of these processes with electronic systems. Each State/UT was required to prepare an action plan covering *inter alia* the changes required in procedures, practices, codes, manuals and laws such as provision for use of digital signatures, file formats, transfer of funds electronically *etc.*, with explicit timelines to ensure achievement of these objectives. Further, completion of BPR exercise was one of the prerequisites for release of second instalment of central assistance.

Audit observed that the DPR submitted (April 2011) to GoI proposed changes to Karnataka Treasury Code (KTC) and Karnataka Financial Code (KFC) leading to acceptance of digital submission of account details to AG. The DPR specified documentation of changes required over KTC and KFC, synchronization of changes with the recommendations in the Functional Requirement Specifications (FRS), submitting the changes to Cabinet for approval and drafting of legislation to bring in appropriate changes. The sub-committees on functional requirements were made responsible for identifying the changes required to KTC and KFC so that they align with the technology. These committees would review the implementation of legislative changes required and redrafting of the codes.

However, the BPR action plan was not prepared. Review of the KTC/KFC and budget manuals to align and transform the business processes to leverage the computerization was also not undertaken by the State Government from the inception of the project. Non-preparation of BPR despite being a condition for release of central grants point to the deficient project implementation.

The Government stated (November 2021) that FD had initiated the process of updating the financial codes.

2.3.2 Compliance to Indian Government Accounting Standards not facilitated

The Indian Government Accounting Standards (IGAS) 1 published on 10 December 2010 deals with disclosure requirements for guarantees given by Governments. This standard provides formats (class-wise and sector-wise) for the information to be disclosed in the Finance Accounts. These reports are not available in the K2 system and further these report formats have not been included in the list of reports required as per the System Requirement Specifications (SRS)⁴/FRS.

Similarly, IGAS 2 was published in May 2011 dealing with Accounting and Classification of Grants in Aid (GIA). GIA disbursed by a grantor to a grantee shall be classified and accounted for as revenue expenditure in the Financial Statements of the grantor irrespective of the purpose for which the funds disbursed as GIA are to be spent by the grantee. Expenditure on GIA for the purpose of creating assets shall not, except in cases specifically authorized by the President on the advice of the Comptroller and Auditor General of India, be debited to a capital head of account in the Financial Statements of the Government. The FRS and SRS did not incorporate this requirement and it was observed that the business rule was not implemented in K2.

Analysis of the voucher data showed that there were 176 vouchers of bills type GIA amounting to ₹3,950 crore during the financial years 2018-19, 2019-20 and 2020-21 which are debited to different expenditure heads in the capital account. Non-implementation of the IGAS 2 standard thus resulted in revenue expenditure of ₹3,950 crore being misclassified as capital expenditure during the financial years 2018-19 to 2020-21.

The Government stated (November 2021) that guarantees are operated by AG and do not form part of treasury operations. The reply is not acceptable as the FD monitors the guarantees and K2 had proposed to capture even the non-treasury transactions.

The Government may provide for appropriate handling of these classes of transactions to make the management of Public Finances effective and strengthening the accountability to the stakeholders.

⁴ SRS – System Requirement Specification is a description of the software to be developed

2.3.3 Status of Utilisation Certificates not made part of K2

The State Government provides grants to various agencies and individuals. At the time of release of these grants, the expenditure is charged off to the functional head of account. The effectiveness and utilisation of GIA released by the State Government is monitored through the mechanism of Utilisation Certificate (UC). The grantees submit the UCs to the department which, in turn forward to the AG (Accounts & Entitlement (A&E)) within the time stipulated in the grant letter. In accordance with the provisions of KFC, the UCs are to be submitted by the grantees within 18 months of sanctioning the grants. UCs outstanding beyond a specified period indicates absence of assurance on utilisation of grants for intended purposes.

Audit scrutiny of FRS and SRS documents showed that the controls for monitoring of the utilisation of grants was not made part of the requirements of K2. There was a pendency of 51 UCs amounting to ₹182.49 crore as of March 2020.

The Government stated (November 2021) that UC was not in the scope of K2. This reply is not tenable as the FRS of K2 had envisaged quick submission of the UCs as a benefit to be realized by the FD. The technical proposal submitted by the SI had accordingly provided for facility for submitting UC and its periodic monitoring by their controlling officers.

2.4 Deficient Master Service Agreement

The MSA comprises of the Service Level Agreement (SLA), the operation requirements, acceptance criteria *etc.* Scrutiny of the MSA revealed the following deficiencies.

2.4.1 Project Engagement Definition Document was not prepared

The MSA mentions about Project Engagement Definition Document⁵ (PEDD), a document describing the services to be performed under the MSA. However, audit observed that the PEDD was not prepared and made part of the MSA. Absence of PEDD resulted in non-description of the services to be provided by SI and also hampered the monitoring of the services delivered by the SI. The Project Director stated (August 2020) that no separate PEDD document comprising the operational components of the RFP and MSA was prepared under the project.

Government, however, shared (November 2021) the Engagement and Development Methodology - Best Practices document stating that PEDD was prepared. Audit observed that the scope of the document shared as PEDD was limited to defining a set of operating procedures to be used as guideline for implementation of project against the listing and description of services as intended in the MSA's definition of PEDD. The document was not signed by both the parties as proof of agreement.

⁵ Project Engagement Definition Document (PEDD) means a written document forming part of MSA. Document describes overall scope, services to be performed, infrastructure and staff details *etc.*, to control the project implementation effectively.

2.4.2 The timelines for deployment of hardware and networking component not specified in agreement

According to RFP, the SI shall ensure deployment and roll out of the entire solution, including hardware, software and networking components, across the entire State of Karnataka in a time bound manner as specified in Section 8 of RFP Volume I. The detailed scope of work, roles and responsibilities of SI for K2 system were stated to be discussed in detail in section 8 of the RFP document. On a review of the RFP documents, it was observed that it did not contain the detailed scope of work, responsibilities and timelines specified for the SI. Instead, it discussed about the high-level requirements of Strategic Control over the Application system by the Government. Such incorrect cross references point to inadequate vetting of the agreement and creates difficulty in understanding the scope of work. Further, in the absence of the detailed timelines there was no benchmark for monitoring the deployment of infrastructure.

2.4.3 MSA did not incorporate the technical proposal submitted by SI

The SI was selected based on the evaluation of the technical proposals submitted by it. The technical proposal would ensure that there were no conflicts between the RFP documents and the technical approach proposed by the bidder. Audit observed that the technical proposals submitted by the SI were not incorporated as part of the MSA. Thus, commitments made in the technical proposal could not be ensured. Due analysis was not done at MSA preparation stage to study the technical proposal submitted by SI and as a result Department did not have control over supply of software and hardware components.

2.4.4 MSA did not incorporate the bill of material as part of the Agreement

The contract included supply of hardware, system software and consumables. The commercial proposal of the SI contained a Bill of Material (BOM) indicating the quantity of items proposed to be used. The BOM submitted by the SI and the terms for regulating the execution of BOM items were not made part of the MSA. Audit noticed that in the absence of an agreed detailed BOM to be supplied, there was lack of clarity on the supplies to be made. For example, the technical proposal proposed 56 numbers of servers for the data centre, the financial proposal proposed 65 numbers of servers, the work order to TCS placed the number of servers to be supplied at 103 and the infra sizing document prepared by TCS estimated the required number of servers at 68. The Steering Committee permitted to deploy the servers based on the infra sizing document. Audit observed that Department procured (2016-17) servers and VMware virtualization software to form a VMware cluster to support the K2 infrastructure indicating that the servers deployed by the SI was insufficient.

Government stated (November 2021) that detailed BOM submitted by SI as part of the financial bid was taken as a reference. However, BOM submitted by the SI should have been scrutinized, third party audited and accepted and formally made part of the agreement. Proper scrutiny of the BOM and its inclusion as part of the agreement would have lent clarity on the contractual obligations.

2.4.5 Penalties for delay in supply not incorporated

The contract involved supply of hardware, system software, consumables *etc.*, as part of the composite contract. However, there were no conditions for penalising the non-supply and delay in supply of the items. It was observed that the SI did not install the Geographic Information System (GIS) software, SLA monitoring tools *etc.*, which were to be supplied as a part of the agreement. However, due to the absence of penalty clause, the contractor was not penalised.

2.4.6 Tolerable Central Processing Unit utilization threshold not specified

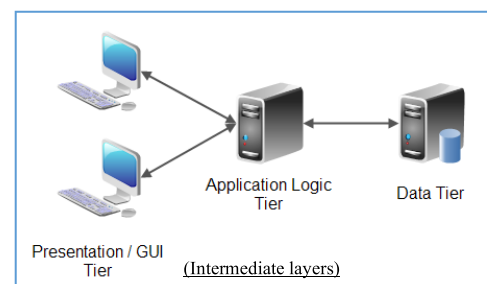
RFP stated that department gives utmost importance to the performance of the server systems proposed and deployed and SLAs would define the minimum performance requirements for the servers deployed, working in a combination of software and hardware. One of the indicators for determining the server utilisation is Central Processing Unit (CPU) utilisation and industry standards consider 70 *per cent* utilisation as a threshold. The RFP proposed to measure the server performance through simulation performed prior to deployment at the user acceptance stage and periodically during the production phase at non-office hours using load/stress testing tools and during real time using the Enterprise Management System (EMS) tools. This check was to be performed constantly to identify any deviations, and in case of deviations noticed, it was to be escalated immediately to the project director.

The threshold assigned is typically 60 to 70 *per cent* and indicates that if more than 70 *per cent* of the server machines' capacity is consumed, an SLA violation was required to be flagged. However, the CPU utilisation standard was not specified in the MSA.

Government stated (November 2021) that the RFP envisaged that application should be able to handle the estimated load as per industry standards and agreed that industry standard is <70 *per cent* CPU utilization. Government also added that if the CPU utilization crosses 70 *per cent*, then that might result in breach of other SLA's envisaged in the RFP. Audit noticed that K2 application became very slow and overall performance of the application was impacted. There were instances when server utilisation reached to 90 *per cent* level. And even though breach had occurred penalty clause could not be invoked as the RFP conditions were not translated into the agreement.

2.4.7 Lack of clarity on application performance SLA metrics

K2 is a N-tier web-based application. N-tier web applications involve a presentation layer (seen and used by end user), a database layer (data storage-retrieval service) and intermediate layers which receive, process and respond to requests made by the presentation layer.



Considering efficiency and user attention span and user satisfaction, it is necessary that the web application responds quickly to the user. This requires that the application, database and server components are designed and

configured to deliver fastest response time. This requirement is specified in the form of performance SLAs. Audit observed that the server and application performance SLA metrics in K2 project were deficient. SLA criteria involve multiple factors (transaction volume, CPU utilization, response time ranges and number of users) and such criteria were not in place.

Service Level metrics were to be specified to regulate the performance under all possible ranges. The MSA specified application performance SLAs for Portal page loading time, when the transaction volume is equal to, or more than 5,000 number of transactions performed per minute over the Internet based application software. No criteria/performance requirements were prescribed to assess the performance for compliance when the number of transactions is less than 5,000. The method for arriving at the baseline of 5,000 number of transactions performed per minute for K2 application was not on record. Further, while time metrics were specified in averages, the base period for averaging and the method of computation was not specified. Specifying SLAs only for a particular range, and not the other possible scenarios resulted in lack of clarity.

Government stated (November 2021) that these SLA parameters ensure that SI configures the application to meet the application performance even at peak load, without causing any inconvenience to end users. Audit is of the view that the criteria for monitoring the application performance during normal course other than the peak load time should also have been made part of the SLA as in its absence there are no yardsticks to handle poor performance during non-peak scenarios.

2.5 Project milestones not revised

The project envisaged milestone-wise payments to the SI based on the progress of the project. The SI was to design and implement a detailed plan of action that sought to execute several activities in parallel, adopt critical path methods and commit additional resources to activities falling behind schedule so as to keep up with the overall deadline in implementation of the project. The payment request from the SI had to be referred to a committee headed by an external expert.

Audit observed that the project deviated from the milestones in its entirety and revised milestones were not set. Thus, the payments to the SI were not made against the set milestones. The milestones prescribed under the MSA are indicated in **Appendix 2.1**.

According to the MSA the SI was required to deploy a defect free K2 solution software at all locations by 70th week of project commencement *i.e.*, by 19 February 2013. The SI was to complete the end user training, deploy the SLA monitoring and measurement system using EMS and establish Call Centre Operations along with the automated solution for Call Centre operations. The O&M phase was to commence from 70th week. Completion of integration of all State Government departments with K2 and training of nominated officers of each department were to be completed by 122nd week.

Audit, however, observed that the project was not completed as of March 2020. As on the scheduled date of completion, even the preliminary milestone sign-

off from DoT on final FRS and SRS was not done. Audit also noticed that MSA was not revised to adjust missed timelines and deliverables.

The MSA came into effect on 18 October 2011 and was valid for a period of 382 weeks covering the pilot phase, roll out phase and continues till the completion of the O&M phase. The SI failed to adhere to the implementation plan and the timelines of the project was completely out of synchronization with the originally envisaged implementation plan.

According to MSA, roll out of all modules of application software and hardware at all Treasuries would be considered as the only benchmark for considering the project development to be complete before the O&M was to commence. The MSA did not provide for negotiating the timelines of overall Go-Live. The deviations in implementation schedule and resultant changes in the project milestones were not brought into the agreement by way of amendments. As a result, there was no legally binding timelines that would force the SI to complete the project expeditiously. This created an environment where slippages in timelines did not have any legal implications for the SI.

Thus, Audit observed that the contract clauses were not invoked to ensure the performance of the SI in line with the original terms of the contract. The process of ensuring the compliance with contract conditions was plagued by delays and inefficiencies. Delays at each stage coupled with poor monitoring as well as poor enforcement of contractual obligations resulted in prolonged non-compliance to the department requirements. The relaxations tilted the balance in favour of the SI and allowed the SI to remain insulated despite not addressing the performance requirements. For *ex.*, the SI often cited delays in the preparation of the SRS, for which it was solely responsible as evidenced by the discussions in the Technical Committee, for the project delays. The SI continued the operations on its terms with deviations which the department ratified through post-facto clearances either on its own or on the recommendations of the committee appointed to suggest future course of action. Neither the department nor the committee adopted a fact and contractual conditions-based approach in evaluating the performance of the contract. These decisions were merely based on the constraints of the project being further delayed and not being supported. The implementation of the project was, thus, rendered highly uncertain and uncontrolled.

Government stated (November 2021) that timelines were set for TCS to complete the activities as per Prof. Sadagopan Committee report⁶. The reply of the Government did not consider the fact that the scheduled time for development and deployment of the application as per the agreement was February 2013 and the Sadagopan Committee was constituted during 2018-19. There were no timelines for regulating the software development contract during the five-year period 2013-2018. Even the timelines recommended by

⁶ Government of Karnataka had constituted (2018) a Committee under the Chairmanship of Prof. S Sadagopan, Director, International Institute of Information Technology, Bengaluru to examine the SI proposal for change in project milestones and terms of the contract and to give its recommendations to the Government after due consideration of the progress made, status of the project and actions to be taken in the best interest of the project.

the Sadagopan Committee were not formalised by means of a supplementary agreement.

2.6 Contract Management

Audit observed that the Contract Management processes in the department lacked rigor commensurate with the scale, risks and values associated with the agreement as discussed below.

2.6.1 *Non-deployment of originally proposed key resource persons*

According to the tender conditions, there shall be no change of personnel proposed for the position of Engagement Manager for the K2 project in the bid from the time of the award of the contract till 153 weeks after the Go-live of the project. Similarly, there shall be no change of personnel proposed for the position of Domain Consultant as well as the software development team leader for the K2 project in the bid from the time of the award of the contract till 122 weeks after the Go-live of the project. The MSA stipulated penalty of ₹10 lakh for every resource changed.

The credentials of the key resources were one of the important criteria in evaluating the bids of the tenderers. The RFP recognised the importance of qualified and experienced professionals for the project as a critical success factor and 28 *per cent* of the weightage in technical evaluation of bidders was given to manpower. Therefore, it was important to ensure that the SI deployed the promised manpower to the project on the strength of whose experience the SI earned the award.

The Technical Committee noted that delay of 130 days in project implementation was due to the inability of the SI in deploying the key resources. Non-deployment of key resources in timely manner invoked penalty clause as per MSA which was not levied upon SI. It was also noted that the replacements proposed lacked the requisite qualification as stipulated in the RFP.

Government stated (November 2021) that there was a time gap from the day of submission of the bid till the award of contract. Audit noticed that the bid evaluation was based on the availability of the key resources and SI had entered into agreement without any amendments. Hence, the department should have enforced the conditions of the agreement.

2.6.2 *Non-submission of the project plan document*

According to the tender conditions, the SI was required to submit a Detailed Project Plan (DPP) for Design, Development and Implementation of K2 Solution at the time of entering into the MSA. However, the SI did not furnish the DPP and this was not made part of the MSA.

The Technical Committee had observed that failure to provide a DPP impaired the capability to measure the project progress in terms of milestones achieved. It was mentioned that in order to save time, the department finalised a DPP with support from a third party Project Management Consultant. The department allowed TCS to simultaneously develop the project plan and also document SRS for the Stage I modules. However, the DPP document submitted by the TCS was not made available to Audit.

2.6.3 Enterprise Management System not established

According to the MSA, the SI were to design, implement/customize a reputed EMS and develop any additional tools required to automatically monitor the SLAs. The SLA recording and reporting system implemented by SI shall be reviewed by a third party auditor who will certify the same. The SI shall ensure that the proposed EMS addresses all the SLA measurement requirements and calculation of applicable penalties as indicated in the RFP. The adherence to the SLA would be computed by the EMS tool implemented by the SI for this purpose. The credits and debits shall be calculated and the total gross amount of Quarterly Guaranteed Revenue (QGR) would be arrived at after deducting penalties, if any.

Audit observed that the SI did not set up the EMS as prescribed. This resulted in reduced capability of the department to monitor the software development and implementation, software performance.

Government stated (November 2021) that monitoring of devices and services was configured in the EMS tool. Audit noticed that configuration of the EMS was dependent on associated database for automatic monitoring of the SLAs.

2.6.4 Penalties not imposed

The MSA provided for levy of penalty for each week (six working days) of delay in achieving any of the milestones. The penalties were to be deducted from the monies due to the SI at the payment milestone. The timelines for each milestone were to be enforced independently, even though some of them were interdependent. This would have cascading effect of penalties for delays in all other milestones dependent on the precedent milestone. The RFP had, therefore, stated that the SI was to be extremely careful in establishing an excellent project management set up to avoid delays.

Technical Committee had attributed the delay of 244 days to the SI as follows:

- Delay of more than 52 days for failing to submit the requisite performance bank guarantee for the mandatory period of seven years as stipulated in the RFP.
- Delay of 130 days due to the inability of the SI in deploying the key resources *i.e.*, Engagement Manager, Domain Expert and Software Development Team Lead, proposed during the bidding process.
- Delay of 112 days due to the substandard quality of SRS documents submitted, reflected inadequate understanding of Treasury and Government functions, whereby the SI withdrew all the initial SRS submitted.
- Delay of 199 days caused by the SI on account of its failure to develop an acceptable project plan. The project plan submitted by TCS to the Department was unsatisfactory and suffered from deficiencies.

The Department also reported on the poor quality of SRS documents, the deficiencies in presentation like inadequate detailing, presenting incorrect information and inept description of processes, written against a total vacuum of understanding of the vision of the project, with other semantic deficiencies

such as use of inconsistent terminology, incomplete usecase and process flow diagrams resulting in sketchy, disconnected and fragmented pieces.

Audit observed that though the SI did not achieve even the first milestone of preparation and submission of SRS within the specified 11 weeks and the delay was attributable to the SI and poor quality of the deliverables, penalty clause was not invoked. Audit calculated the penalty for the delay in achieving the first milestone for the period from 12th week to the 37th week alone, which worked out to ₹3.00 crore⁷.

Thus, though stringent penalties were prescribed in the MSA for breach of milestones, DoT did not invoke the penalty clause to ensure the compliance to the achievement of the milestones. Strict timelines, obligations and penalties in the tender affect the cost, effort and risk perception of the bidders with impact on tender amount and this lenient handling of contract performance by the selected vendor runs against the spirit of the procurement process.

The Government stated (November 2021) that the delay on SRS preparation was attributable to both SI and the department. Audit observed that the Technical Committee (2012) had attributed the delays solely to the SI.

2.6.5 Extension of maintenance contract even before completion of the original contract

As per the original contract, the O&M phase would commence from the 70th week *i.e.*, after successful deployment of software solution across all locations and would be valid for a period of six years. As discussed earlier, the project milestones were not adhered to, and the application was developed on a piece-work basis rendering the original contract schedule outdated. Consequently, the O&M phase could not be determined.

It was observed that none of the modules were completed within the scheduled period of February 2013. A part of the Stage I comprising six modules were operationalised for the first time during September 2015. The remaining six modules were completed between 2015 and 2019. Pension Module of Stage 1 and none of the Stage II Modules were deployed in production during the original period of contract from October 2011 to September 2019. Thus, these 12 modules were out of O&M service. Despite this the department permitted the SI to treat the O&M period of first contract as completed by September 2019. Considering this the O&M phase should have been counted from at a minimum from September 2015 and extended up to September 2021. However, the department closed O&M phase in September 2019. Thus, the department lost the benefit of O&M for K2 by two years, due to delay in the development phase and parallel running of the O&M phase and made an additional financial commitment of ₹38.75 crore for the period 2019-21, as shown in **Appendix 2.2**. The department also had to procure system software licenses and maintain

12 th week to 22 nd week (10 weeks) –	5,00,000* 10 =	50,00,000/-
22 nd to 27 th week (5 weeks)	10,00,000*5 =	50,00,000/-
27 th to 37 th week (10 weeks) –	20,00,000*10 =	2,00,00,000/-
Total –		3,00,00,000/-

hardware which otherwise would have been the responsibility of the SI during the O&M phase.

The SI sought for revision of the rates for continuing the O&M operations after completion of the original term of the contract. The department entered into a revised contract at ₹125.44 crore for a further period of five years with support for application, Data Centre and Disaster Recovery Centre maintenance. The cost of revised contract worked out to 1.5 times the total price of the original contract (₹79.62 crore) and was more than 3.5 times of the original O&M cost (₹34.29 crore which was inclusive of helpdesk activities and maintenance of the infrastructure at district levels).

Government stated (November 2021) that the contract duration was set as per MSA and as recommended by the Sadagopan Committee. Audit noticed that the department lost two years of maintenance period at the originally agreed rates due to delay in development phase and concurrent running of the O&M.

2.6.6 Contract closure procedure not followed

The department concluded the original contract during September 2015 and entered into a new maintenance contract. The new maintenance contract did not factor the incomplete development works of the original contract. The department did not follow the contract closure procedures as discussed below:

According to the procedure specified in Karnataka Public Works Code, the department was to make sure that all the deliverables are executed, and the department accept the document agreeing that the deliverables are done according to the requirements. The missing deliverables, if any, are identified and the contractor agree to work on these issues before the final delivery and closure of the contract.

The certificate of completion should be furnished by the officers concerned after the actual date of completion of the work. In case where it is not desirable to keep the contract open for carrying out minor incomplete items, the main contract is finalized after getting a supplementary agreement executed in the prescribed form by the same contractor for doing the residual work at his agreement rates.

During the final closure of the contract, the Contractor prepares a handing over report for seeking department's acceptance and approval. In Government, a project completion certificate is issued, and the final bill of the Contractor is prepared and finalised. However, it was observed that no completion certificate was issued, and deliverables were not formally taken over.

The State Government should prescribe closure procedures for software development projects to secure the mutual acceptance of the project deliverables.

2.6.7 The FRS and SRS requirements not monitored through a Requirement Traceability Matrix

The MSA required the SI to prepare and provide a Requirement Traceability Matrix (RTM). The K2 system developed/customized by SI would be reviewed and verified by the department against the approved functional requirements using the RTM developed by the SI. The acceptance testing against the functional requirements would be performed by independent third-party agency (external audit), as well as the select internal department users with the assistance of the RTM.

RTM is a document that maps and traces user requirement with test cases. It captures all requirements proposed by the client and requirement traceability in a single document, delivered at the conclusion of the software development life cycle. The main purpose of RTM is to validate that all requirements are checked via test cases such that no functionality is unchecked during software testing. It should contain the Requirement ID, Requirement Type and Description, Test Cases with Status mapped from RFP, SRS, SDD, Coding, Testing and final exit after knowledge transfer.

In the absence of a procedure to review the RTM periodically, audit could not confirm whether all the requirements specified in the FRS/SRS was finally brought into the application or not.

Audit also observed that RTM omitted change requests and did not cover features promised in high level technical document. Absence of a proper RTM led to department not being able to readily ascertain the tasks pending development from time to time in terms of requirements specified in the FRS.

2.6.8 Non-handing over of source code

Source code refers to the list of instructions that is written by a human programmer using programming languages such as C, C++, JAVA, *etc.*, and forms the recipe for a software application. Possession of the software source code is critical for security of the financial application systems, and it also allows the department to make subsequent modifications, fix bugs and roll out updates.

As per MSA, the ownership of the source code vests with DoT and it should have the total and exclusive intellectual property rights over the source code written for developing or customizing the K2 application. Further, the SI shall not use the source code in any other places without seeking permission from the department and without carrying out a basic sanitisation of the code. Upon completion of Go-live, the SI was required to submit the updated source code.

Audit observed that source code was hosted at TCS premises, Gandhinagar and not handed over to DoT. It was also observed that M/s. Price Waterhouse Cooper Cyber Security Team engaged by the department for strengthening cyber security reviewed the source code at TCS Office, Gandhinagar. Thus, the source code belonging to the State Government was held by the SI in its own premises without providing adequate access to the department for its review and utilisation in violation of the MSA.

Further, testing the source code as part of the procurement contract is important to ensure that source code could be used to build the application if required at a later stage. It needs to be verified whether it would be possible to build the application from the code on another system using a copy of the source code and if it is not possible, then the problems within the code needs to be identified and fixed. The Department did not furnish to audit the details of demonstration of the application which could be rebuilt using the source code *etc.* Hence, Audit could not vouch for the testing of the source code either by the Department or through an external agency.

Government stated (November 2021) that the source code was handed over to the Department during September 2019. The reply is not acceptable as the source code was still not available with the DoT but with the SI as there was no facility in the K2 data centre to securely store it. Further, the reports of handing over, its custody and the procedures in place to securely store the source code *etc.*, were not made available. Not having the custody of the source code impacts the ability of the State Government in securing envisaged level of strategic control.

Since MSA conditions were not addressed in terms of ownership of the source code, it is recommended that the State Government should take appropriate measures to obtain the complete source code and maintain custody in a location controlled by it to ensure strategic control in the case of an unplanned exit and for use in capacity building.

2.6.9 Non-assessment of Technology Stack resulted in vendor lock-in

A systematic examination of the technology stack/technical architecture proposed by the SI for both benefits and adverse consequences forms a critical step in the implementation of the Project and would ensure that the impacts and the mitigation measures are considered in the project design with minimal damage to project and optimal use of resources. GoI guidelines on Treasury Computerisation and best practices require the departments to safeguard the Government projects from tech lock-in/vendor lock-in.

Audit observed that the technical architecture document proposed by the SI was not assessed by the Technical Committee for its dependency on proprietary software DigiGov. Even the Tender Scrutiny and Evaluation Committee merely stated that TCS solution is a custom developed software and did not deliberate on the dependency risk it would pose to the continuity of the software maintenance and operations in the eventuality of the SI exiting the project. The justification for employing a proprietary product (the specifications of which are not publicly known, whose patches and updates are not released on public domain and to which the department has no rightful access) in a highly significant critical financial application of the State Government was not on record.

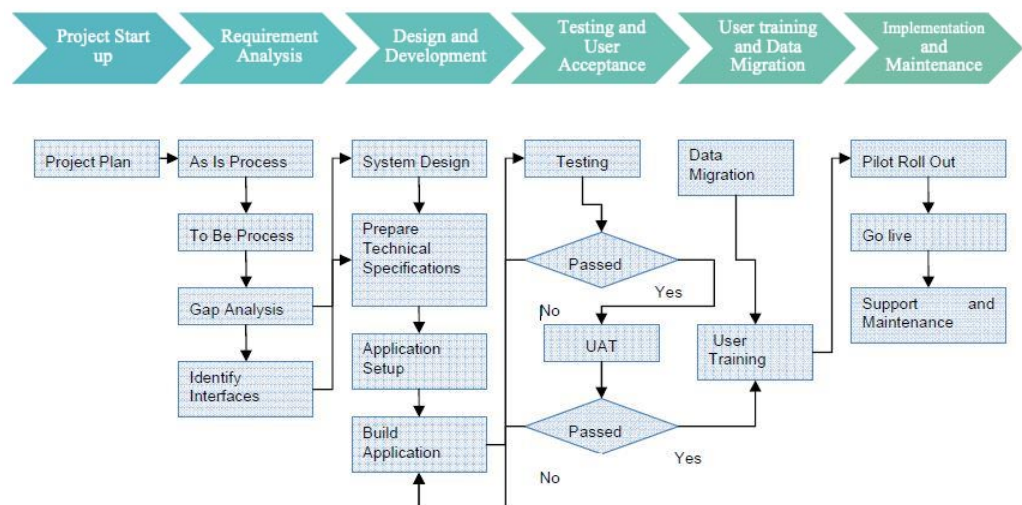
The impact thereof was that the vendor refused to provide design documents of the Workflow Management System and Application Security and Common Applications to the department which hampered the independent maintenance of the application and defeated the objective of strategic control envisaged in the RFP. The department was also forced to extend the O&M contract with TCS

for a further period of five years from September 2019 without inviting tenders after obtaining relaxation under the Karnataka Transparency in Public Procurement (KTPP) Act. Failure to critically examine the technical architecture proposed by the SI resulted in a vendor lock-in scenario for the project.

Government stated (November 2021) that the workflow engine is proprietary product around which the application was developed. The MSA provides for mechanism to safeguard against vendor lock-in. Audit noticed that the existence of a workflow engine, the suitability of its features to the K2 application development, the licensing conditions of the workflow engine *etc.*, was not considered while selecting the SI. MSA did not have any mention of this workflow engine. The absence of an Exit Management Plan coupled with lack of a well-defined data dictionary created dependency on the vendor for continued application maintenance.

2.7 Software Development

The project envisaged the following model for development of the software.



2.7.1 Delay in preparation of SRS and System Design documents and status of review of SRS by the Department

According to the project timelines, SRS for all modules was to be delivered before February 2012. However, the first SRS that of the Receipts Module was signed off during March 2013 *i.e.*, one month after the originally scheduled date of completion of the entire project. The SRS of nine modules were signed off between May and December 2013, eight between January to December 2014, two between January to December 2016, three during August 2018 and SRS for one module (Accounts Compilation) was signed off between December 2014 and February 2016.

Verification of the SRS documents made available to audit showed that 13 out of 27⁸ SRS documents did not contain the details of having been reviewed by the Department. The SRS documents reviewed mainly related to Stage I modules which contained the functionalities related to K1. The House Building

⁸ One Module (General Module) had 4 SRS documents.

Advance (HBA) Module was reviewed by only one official as against the requirement of three tier review.

Further, the sign-off from department on SDD, testing approach, test case and test plan documents was to be completed within T+25 weeks. The SDD was completed and signed off for 20 modules during July 2017, for one module (Expenditure Tracking) during October 2019 and for three modules (Fiscal Management, Non-Treasury Transactions (NTT) and Asset Liability Management (ALM)), the SDD was yet to be submitted by the SI. Audit observed that the Testing Approach/Test Case/Test Plan was not available in the SDD submitted. The module-wise status of sign-off of SRS, SDD and review of SRS by department is indicated in **Appendix 2.3**.

The Government stated that all SRS and SDD were submitted at time of closure of first contract for Stage I in 2019. The fact remains that as per MSA, the SRS documents, which were to be delivered by February 2012, was delivered after a delay of seven years by SI. This in turn resulted in delay in implementation of project as pointed out in paragraph 3.1.

2.7.2 Deviation from Software Development Life Cycle model

The MSA envisaged use of Software Development Life Cycle (SDLC) model, for software development and rollout, also known as Waterfall Model. All the modules were expected to be developed, tested, and submitted for user acceptance, third party certified, authorized for production and rolled out as an integrated package. However, the modules were developed in a piecemeal manner by the SI extending over a period of eight years affecting the integration, testing of the modules, user training, data aggregation and data migration.

The Department stated (August 2020) that they switched over from SDLC model to agile model. The agile development model requires close interaction between business users and developers. It was observed that the development team was located at Ahmedabad with domain experts stationed at Bengaluru which handicapped the methodology adopted. MSA and SLA provisions were not modified to reflect the change of development model from SDLC to agile. No documents were in place to support the change of methodology from SDLC to agile model such as the Technical Committee approval, tools to be used in implanting the agile model to validate the reply of the Department. On the contrary, it was observed that the Technical Committee advocated (March 2014) use of SDLC standards for development model.

Government stated (November 2021) that the application rollout was conceptualized to be waterfall model with all application modules to be ready as a pre-requisite. The roll out strategy was revised to agile model with staggered roll out of modules. Audit noticed that the change in development methodology demanded identification of tasks in detail, prioritisation of the tasks in a timebound manner. The change in development model from waterfall to agile was not made part of revised contract agreement.

2.7.3 Deployment of application without Third Party Audit

As per the MSA, the project was to be deployed live only after it was certified by the Third Party Auditor (TPA). The DoT would select an agency for

performing the audit over the K2 system. The third-party audit included monitoring the performance of K2 with a view to ensuring desired Quality of Service (QoS) by the SI. The TPA would review the entire array of deliverables produced by the SI for quality check and conformity to the requirements. The TPA would be responsible for concurrent audit of K2 Application, conducting User Acceptance Test (UAT) and Functional Compliance Audit, Security and Implementation Audit, Performance Testing and Penetrative Testing. SI was required to address all the gaps identified during the testing to the satisfaction of the DoT or its nominated agency prior to Go-live.

The DoT had engaged (January 2012) M/s KPMG as the TPA for the project for a consideration of ₹47.30 lakh and a MSA was signed. Payments were to be made as per the milestones prescribed in the MSA. An amount of ₹10.64 lakh was paid (April 2013 and December 2014) to the TPA, albeit with deviations from the payment milestones. Audit observed that the services of TPA were not available since 20 November 2015 as the contract was not extended. Notices were issued during December 2015 and thereafter the services were terminated on 6 April 2016. Consequently, all the modules developed subsequent to November 2015 were rolled out without TPA. The DoT failed to furnish to audit the copies of the TPA reports, action taken by SI and its acceptance by the department. Hence, audit could not ascertain the extent of work carried out by the TPA.

Further, no TPA was employed despite directions (April 2016) from the Steering Committee resulting in Go-live of K2 without TPA certification. This was highly irregular and resulted in deploying an unsafe system without testing. In view of such a significant deviation from the agreement, Audit could not derive any assurance on the authenticity and integrity of the transactions carried out through K2 application.

The Government stated (November 2021) that KPMG had conducted the Audit of K2 application software and IT infrastructure before “Go-Live”. The reply is not acceptable as the service of the KPMG ended in November 2015, no modules were ready in production as of November 2015. KPMG conducted audit of initial documents such as SRS and data centre infrastructure *etc.*

No other audits were commissioned with the mandate provided by the MSA to the TPA in terms of scope after the exit of KPMG.

2.7.4 Service Level Agreement monitoring system not deployed

The SI was required to deploy an SLA Monitoring and Measurement system and develop additional software and scripts to measure performance and generate SLA compliance reports. Further, according to the MSA, the payment during O&M phase was subject to successful demonstration of SLA measurement process/reports for the SLAs indicated as well as submission of all necessary operational reports as specified in the RFP. The SI was to implement any additional tools to record and report the performance indicators as detailed in the SLA matrix. The SLA reporting tools/process implemented by the SI was subject to third party review and SI was to address any issues identified during such third-party review for achieving the eligibility for this payment.

Audit observed that the SI did not deploy the SLA monitoring tools for enabling monitoring of the project implementation. However, the SI was paid ₹52 crore without ascertaining the achievement of the phase-wise project milestones. A case of SLA metric impacting the monitoring of K2 performance is illustrated below.

The MSA included an SLA for monitoring the portal page loading time on a periodic basis by accessing it from the data centre. The portal page loading time was to be routinely measured over a leased circuit or equivalent at a minimum 128 Kbps bandwidth shared between two users. All portal pages would be tested for performance and an average of the total time taken, calculated by dividing the sum of response times for all pages by the number of pages requested, would be considered for this SLA.

Response time at all Treasuries were to be monitored. The average response time would be calculated by dividing the total response time for all requests summed together by the number of requests made to the application system. The simulated queries would be executed on a periodic basis by accessing the reporting application from the data centre and the time thus generated would be used to calculate the SLA.

However, the SI did not implement any tools to monitor the application page loading time and response time at Treasuries from time to time. Help desk data captured also did not have categorisation for monitoring the incidents relating to slowness or poor performance of the Application. Though the Technical Committee discussed the slow performance of the K2 Application from time to time (January 2017/December 2020), such discussions were made without the aid of insights from the SLA data such as average page loading time, treasury response time *etc.* In the absence of adequate data, it was not possible for K2 management to determine the level and quality of service provided by the SI and to suggest measures for improvement and to monitor whether the suggested levels of improvements were achieved subsequently. While K2 engaged IBM for identifying the performance bottlenecks as discussed in **paragraph 2.7.6**, the levels of improvement achieved in practice could not be determined and reported in the absence of SLA measurement and reporting.

Government stated that SI has not configured all the SLA's envisaged in the RFP. Hence department has deducted applicable penalty amount from the bidder's payment. Audit noticed that the penalty clause for non-configuration of the EMS and SLA monitoring tools were not available in MSA. The department should have insisted on the execution of this component which was critical for monitoring the performance of the contract.

2.7.5 Training not imparted to Department personnel

The success of an information technology-oriented project depends on the extent the end-user feels part of the entire process of transformation. Training was to be provided for various types of users from the level of super-user to the end-user level. Technical proposal submitted by the SI envisaged knowledge transformation to start on completion of the integration testing phase of the project and before sign-off of UAT.

The details of the training activity proposed for various users is indicated in **Table 2.3**.

Table 2.3: Details of training activities proposed for various users

Sl. no.	Category of user	Area of training	Whether training conducted or not
1	Treasury staff (Application Software Users)	Application software use	Conducted
2	Other department staff (DDO, CCO, CO, BEO, FD <i>etc.</i>) (Application Software Users)	Application software use	Conducted
3	Core team of 15 Treasury Officers (In-house technical experts)	Technical training on RDBMS, Programming Languages, Operating Systems, EMS and SLA Monitoring, Security and Controls.	Not conducted
4	K2 champions (DTO Key officials, PMU members, Members of core group)	K2 IT Architecture, K2 life cycle, change management, application software, security <i>etc.</i>	Training conducted only on application software usage.
5	Policy makers (Decision makers)	Importance of K2 and process changes being brought in	Not conducted

Thus, training as envisaged was not conducted for the various users. The details of the claims made by the SI on training costs was yet to be furnished to Audit.

The SI had indicated ₹1.65 crore towards training costs and had proposed for designing the training courses and preparation of training materials based on the evaluation of training needs at different levels of the organisation across geographies. However, the documents relating to training need analysis prepared by SI and the documents relating to assessment/evaluation of the proposed activities such as assessment of trainers, feedback from trainees, training of master trainers and champion users were not made available to Audit.

The technical training on database and application handling, coding, EMS, Operating systems *etc.*, was not provided to the core team of the State Government. The Department did not build sufficient internal expertise to position itself in a competent and advantageous position of understanding the Project for enabling it to independently select a replacement partner through competitive tendering. Consequently, the contract was extended based on the terms and conditions and rates proposed by the SI after seeking exemption under the KTPP Act.

Government stated (November 2021) that detailed trainings have been conducted on Project Life Cycle, Change Management, BPRs, Application software, Security, *etc.*, through e-Governance - National Institute for Smart Government (NISG). Audit noticed that imparting training was the responsibility of SI according to MSA and not of e-Governance - NISG.

2.7.6 Engagement of IBM Accelerated Value Program and Red Hat Professional Services

According to RFP, the broad sets of responsibilities of the SI were development/customization and deployment of K2 system, providing IT infrastructure for the System and its maintenance including disaster recovery, performance maintenance of the application, user training for Government users and other stakeholders, system administration/operations training to the select employees of DoT, helpdesk services/helpdesk support *etc.*

The SI was responsible for timely upgrades and patches of operating system and firmware; regular performance tuning and monitoring of the system (application and database) to enhance its performance and comply with SLA requirements on a continuous basis. All these preventive measures form part of the overall responsibility for maintenance of K2 by SI.

Audit observed from the agenda and notes of the Technical Committee (TC) meetings that the system experienced frequent database downtime and poor application response, frequent deadlock, database lock not getting released and CPU utilisation exceeding 90 *per cent*. To overcome these problems and help in resolving application performance issues and reduce downtime of the application/portal, the department decided (January 2017) to employ IBM Accelerated Value Program (AVP) at a cost of ₹90 lakh and Red Hat Professional Services for preventive maintenance at a cost of ₹29 lakh. The agencies were to provide support for maintaining the application performances to the desired level.

As these were the responsibilities of the SI, engaging separate agencies to address these issues indicate the lack of expertise deployed by the SI. This also resulted in avoidable expenditure of ₹1.19 crore and extending undue benefit to the SI. Interestingly the PMU for the project apprised the TC that the support under O&M was “limited only to resolving issues related to the product; the support arrangement provided by SI was for reactive support only; and K2 being a critical financial application needs proactive support from Red Hat Professional services”. Such an interpretation by PMU was not in conformity with the provisions of the MSA.

Government stated (November 2021) that while SI has implemented the solution, there has to be a review of the deployed solution by a third party to ascertain that the solution implementation is compliant with the best practices. Hence, Red Hat professional services and IBM AVP support services were taken by the department to ensure better security and performance of the application. Audit is of the view that the scope of the work assigned to the IBM was not in the nature of third-party review but included knowledge transfer, upgrade planning, performance tuning *etc.*

2.8 Change Management

The MSA specified the procedure to be followed in the event of any proposed change to the Agreement, Project Implementation Phase, and Operation and Management of SLA. Accordingly, change requests would emanate from the Project Managers of the parties to the MSA. Change Control Notes (CCNs)

prepared by Government/SI will be presented to other Party's Project Manager who will acknowledge receipt by signature of the CCN.

2.8.1 Software Change Management

As per the RFP, the SI shall define the Software Change Management and Version control process and obtain approval for the same from the department. For any changes to the software, the SI was to prepare detailed documentation including proposed changes, impact to the system in terms of functional outcomes/additional features added to the system, *etc.*, and obtain approval from the department for the proposed changes before implementation into production environment. Such documentation is subject to review at the end of each quarter of O&M support. Audit observed that though there were several changes in the SRS and SDD, these were not approved by the Technical Committee.

Further, the application software shall be version controlled adopting the industry standard practices like Version Control System (VCS), Source Code Management System and Software Configuration Management (SCM) and the System shall permit the latest versions of the application. Audit observed that the VCS, Source Code Management System was not in place and SCM was incomplete as it omitted software component of reports generation.

2.8.2 Configuration management process not in place

The MSA envisaged that K2 should have the ability to track changes in configurations of the system components and the SI was responsible for the daily maintenance of the configuration. The configuration management involves identifying and labelling the configurable items, taking measures to protect the configurable items, establishing a baseline for the configurable items, keeping a record of the configurable items (date of release, locations of the configurable items, proposed changes to them *etc.*). The configuration items are regularly checked and audited in order to ascertain they are in consistent state. The process of identification, auditing, reporting and approval *etc.*, needs to be documented.

Audit noticed that K2 did not have a configuration management⁹ plan in place to manage continual enhancements of the application. The Project also did not have the updated system support documentation reflecting the changes since the original release of the application. Up to date documentation is required to effectively support the application and ensure that key application knowledge is not lost. This is particularly important to K2 as fixes and enhancements to the application are made by the SI.

2.8.3 Inadequate documentation in Change Control Notes

Volume III of RFP states that the Project Director, K2 and the SI recognize that frequent change is an inevitable part of delivering services and provides a format for floating a CCN with three parts Part A – Initiation, Part B – Evaluation and Part C – Authority to proceed. The RFP also refers to the use

⁹ Configuration management is a process for maintaining computer systems, servers, and software in a desired, consistent state. It's a way to make sure that a system performs as it's expected to as changes are made over time.

of CCNs for performing any functional changes to the system. The CCN and its approval process is an instrument to manage and control changes. The format for CCN considers the need for recording details of the change such as reason for change, a description of the change, brief description of the solution, *etc.* It also provides for numbered attachments to support the CCNs. For *ex.*, CCN no. BC 11 records the following information:

Description of change:	Disabling Notification feature from "Fund release by AD to Group of DDO" and "Fund Release by CCO to Group of DDO" in cases where group of DDO comprise of more than 500 DDOs
Change Reason(s):	While releasing funds to a Group of DDOs which has many DDOs, file was not getting approved as system was unable to send notification to such large number of users. After discussion with the Department, it is decided that notification feature can be disabled in case the group of DDOs comprise more than 500 DDOs. This will help improve performance of this process.

However, a review of CCN documents provided to audit showed instances where the justification of changes was not recorded in sufficient detail. While the reasons for change in Part A was recorded as 'Requirement raised by PMU/Change based on discussion with PMU team', the brief description of the solution and impact in Part B was recorded as 'As explained in description of change in Part A'. A few illustrative instances are indicated in **Appendix 2.4**. Recording such reasons creates a situation of relying on the ability of the concerned PMU staff to recollect the reasons and context during later reference and details not being available when change in PMU staff occurs. Similarly, inadequate documentation of the description of the solution and impact of the change reduces the visibility of the fix / change at a later date.

2.9 Helpdesk Management

The primary objective of Helpdesk is to provide a single point of contact for all problems, issues, requests and queries coming from the client environment and that associated information is maintained and reported in accordance with SLA. Helpdesk should register reported problems, assign trouble-ticket to concerned technical staff, track the resolution of trouble-tickets and prepare reports for analyzing components of the IT infrastructure more prone to failure. SI also proposed to configure the EMS to automatically detect certain incidents. Processes and Strategies for the resolution of trouble-tickets, either reported by end-users or automatically detected by EMS were to be in place.

2.9.1 Incomplete data on tickets raised

Audit observed from the information furnished (**Table 2.4**) that the number of tickets for registering complaints increased from 3,114 in 2015-16 to 17,275 in 2017-18 and decreased to 2,520 during 2019-20. The information furnished was, however, incomplete as there was a total of 1,60,925 gaps in the ticket serial numbers during the period 2015-16 to 2019-20.

Table 2.4: Statement showing the number of tickets raised and gaps

Sl. No.	Year	Total Tickets raised	Number of gaps observed in the data	Total
1	2015-16	3,114	5,601	8,715
2	2016-17	15,140	36,227	51,367
3	2017-18	17,275	38,961	56,236
4	2018-19	15,020	23,724	38,744
5	2019-20	2,520	56,412	58,932
	Total	53,069	1,60,925	2,13,994

Source: Data furnished by Project Management Unit

The reasons for the sharp decline and for the gaps were not explained to audit.

2.9.2 Incomplete database

Categorisation of data - The data in helpdesk was to be classified under a three-tier categorization to facilitate proper analysis. This three-tier classification was not available for 36,735 tickets.

Root cause for incidents - The helpdesk data contained a field to record the root cause for an incident. This was empty for 20,641 tickets.

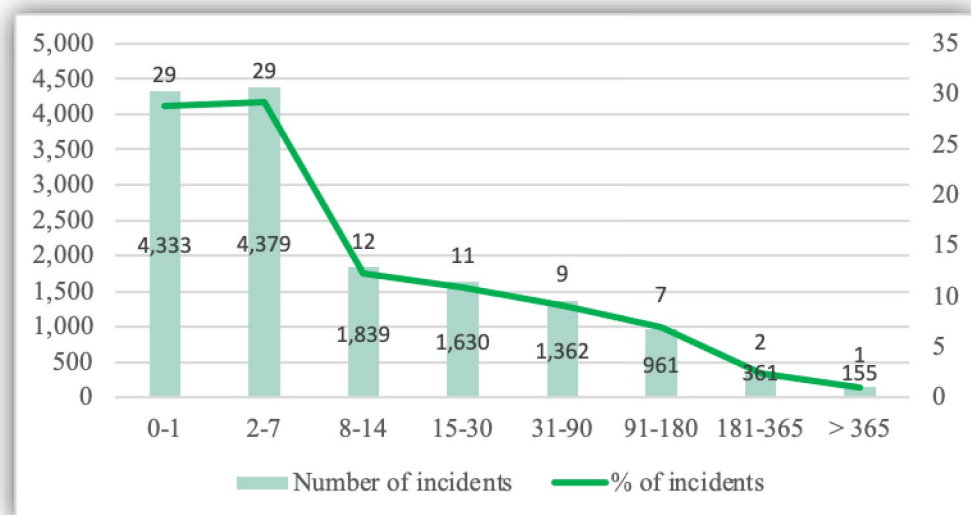
Originating department – The field for capturing the name of the originating department was empty and recorded as ‘others’ for 49,607 and 12,653 tickets respectively.

Such gaps affect the quality of the helpdesk data and its ability to provide useful insights for proactive maintenance of the application including need for changes in the application, user training *etc.*

2.9.3 Resolution of tickets after specified time

The RFP specified the average resolution time for problems recorded at help desk for various categories, the minimum being <4 hours (problems related to user understanding of K2) and maximum <15 hours (problems related to local infrastructure at sub-treasuries). The time taken were to be recorded using help desk tools and application performance monitoring tool. The time taken beyond the prescribed limits would be considered as a breach.

Audit observed that the help desk metrics were not computed and reported to the PMU by the SI. The data furnished to Audit did not indicate the time of closure of tickets except for the year 2018-19. Hence, the resolution time and delays thereon could not be computed and analysed for the entire audit period. Analysis of the data for the year 2018-19 showed that 71 *per cent* of the incidents reported upon were closed after the breach of the specified resolution time as indicated in **Chart 2.1**. It can also be seen that 155 tickets were resolved after more than a year.

Chart 2.1: Time taken for resolution of tickets during 2018-19

Since the exact time of closure was not available, Audit could not match the time of resolution in terms of number of hours.

Audit also observed that the helpdesk unilaterally declared the resolution of ticket raised by users. In 2019, 31 *per cent* of tickets were marked as closed without recording the action taken. There was no facility available to obtain feedback on resolution of the ticket from the originators. The only way for a ticket originator to inform the non-resolution of the complaint was by raising another independent ticket which was not linked to the original ticket. In the absence of a feedback mechanism, the effectiveness of the helpdesk functionality was not independently verifiable by audit. The department did not furnish the details such as monitoring of helpdesk activities, number of change requests initiated based on analytical reports submitted by the helpdesk, EMS configured to facilitate the automatic identification of the critical incidents *etc.*