

CHAPTER – IV

Department of Scientific and Industrial Research

4.1 New Millennium Indian Technology Leadership Initiative Scheme

New Millennium Indian Technology Leadership Initiative Scheme, implemented by Council of Scientific and Industrial Research with the objective of building, capturing and retaining a global leadership position for India in selected areas through scientific and technological developments, did not yield expected results. Out of 30 projects seen in audit, technologies were commercialised in only four projects. Nine industrial partners defaulted in repayment of loans of ₹ 64.92 crore. There were instances of insufficient monitoring, non-compliance with scheme guidelines and time and cost overruns.

4.1.1 Introduction

The New Millennium Indian Technology Leadership Initiative (NMITLI) Scheme was approved by Cabinet Committee on Economic Affairs (CCEA) in March 2003 for Tenth Plan³⁰ Programme. The scheme was to be implemented by Department of Scientific and Industrial Research (DSIR) through the Council of Scientific and Industrial Research³¹ (CSIR). The scheme envisaged participation of both academic/research institutions and industry. Objective of the scheme was development of sustainable and eco-friendly new technologies/concepts for Indian industries.

Under the scheme, projects were to be evolved after national consultation exercise involving persons from academic/research institutions and industry. Conceptualisation of projects followed two routes viz. (i) Nationally Evolved Projects (NEP); and (ii) Industry Originated Projects (IOP). The process of selection of nationally evolved projects began with short-listing of ideas by a Screening Committee followed by selection of the areas by field expert groups. Project development in the selected areas was carried out by 'domain champions'³² after brainstorming. Identified agencies (research institutions/ industries) were then invited to participate in the projects. In the case of projects originated by industry (IOP), the process began with soliciting of proposals through press advertisements and personal letters from Director General (DG), CSIR. The screening of proposals

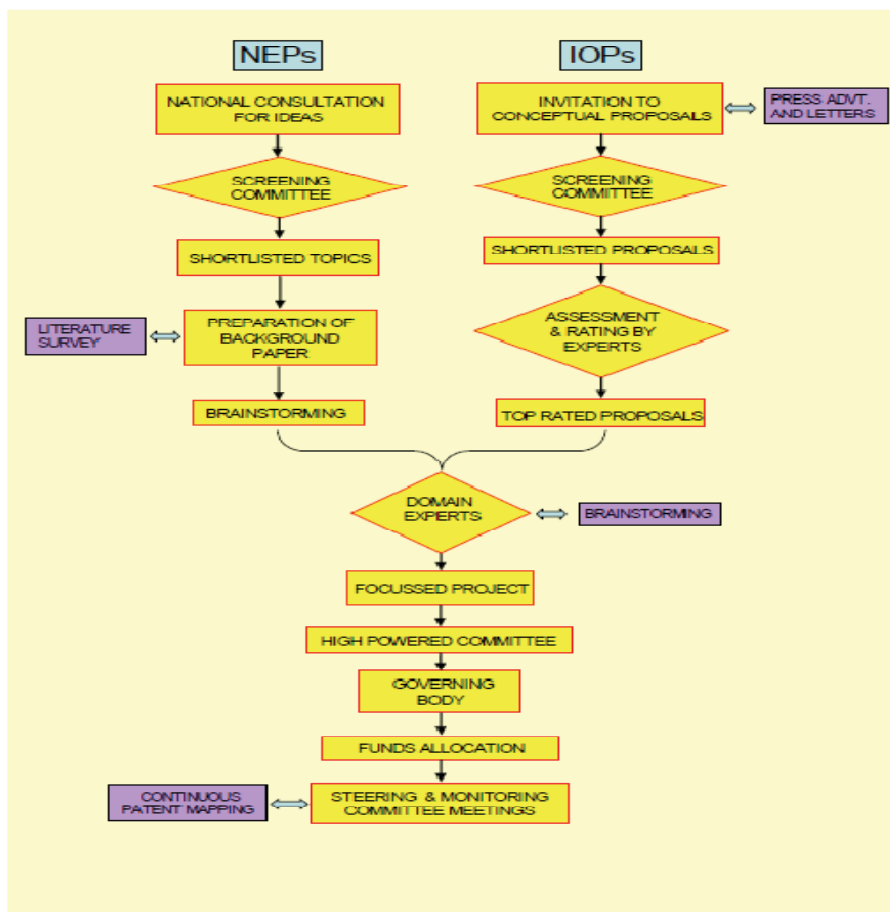
³⁰ Period from 2002 to 2007

³¹ An autonomous research and development organisation under DSIR

³² Field Experts

thus received was carried out by a committee followed by assessment and rating of shortlisted ideas by field experts. Two top rated ideas in each field were developed into projects with the assistance of NMITLI designated experts. After finalisation, projects were reviewed by a High Powered Committee³³ (HPC). Based on recommendation of HPC, projects were approved by Governing Body of CSIR for funding. The process of project formulation and monitoring is given at **Chart 5**.

Chart 5 - PROJECT FORMULATION



NEP: Nationally Evolved Projects or Projects of national interest;
 IOP: Industry Originated Projects or Projects originated by industry

Financial support to projects under the scheme was in the form of (a) grant-in aid to institutional partners and (b) soft loan with simple interest at the rate of three *per cent* to industrial partners. Projects were to be implemented within two to five years. Technologies developed under these projects were to be commercialised through industry.

³³ A committee constituted by Director General, CSIR, comprising of experts from diverse fields to assess and evaluate NMITLI projects.

CSIR formulated guidelines for implementation of projects under NMITLI scheme. The scheme was further continued during the Eleventh Five Year Plan³⁴ period.

4.1.2 Budget and expenditure

CSIR formulated a total of 75 projects under NMITLI from 2000-01 to 2012-13, out of which 73 projects were taken up for implementation. Against the project outlay of ₹ 733.44 crore since inception of the scheme, funds of ₹ 630.50 crore had been released till March 2014. This included grants of ₹ 369.72 crore to various institutions and loans of ₹ 260.78 crore to industrial partners. The details of year wise releases are given in **Appendix XV**.

4.1.3 Audit Findings

Of 73 projects supported by CSIR under NMITLI scheme, Audit scrutinised 30 (19 NEP; 11 IOP) randomly selected projects. While a brief profile of the 30 selected projects and a gist of audit findings for each of these 30 projects are given in the **box**, issue-wise audit comments are given in subsequent paras.

4.1.3.1 Achievement of objectives

NMITLI scheme was expected to yield globally competitive, sustainable and eco-friendly new technologies for industry. The projects had well-defined objectives for development of technologies/processes. Audit observed instances of non-achievement/partial achievement of objectives of projects.

(i) Non-achievement/partial achievement of objectives

(a) Out of 30 projects test-checked in audit, none of the envisaged objectives in terms of technologies and processes were achieved/developed under six projects after incurring an expenditure of ₹ 22.73 crore. These six projects in which envisaged objectives were not achieved at all are given in Table 18.

³⁴ Period from 2007 to 2012

Brief profile of 30 selected projects

Name of Project: 1	Development of next-generation Plasma Display Panel (PDP) Technology and 50" High Definition (HD) TV Prototype				
Objectives in brief: Development of a 50" prototype with luminous efficacy of 5 lm/watt.					
Original cost	₹ 24.31 crore	Expenditure	₹ 27.72 crore	Cost overrun	₹ 3.41 crore
Project started	March 2007	Project closed	March 2010	Original duration	30 months
				Time overrun	6 months
Patents	19	Technology developed	Yes	Premia	N/A ³⁵
		Commercialised	No	Royalty	N/A
Audit Comments: The project was able to develop a prototype of 50" with HD compatible design, but luminous efficacy of 5 lm/watt, cost reduction and reduction of power consumption could not be achieved. Therefore, technology was neither transferred nor commercialised.					

Name of Project: 2	Design and Development of cushion bonded/rigid bonded organic cerametallic cookie and single/duel sintered buttons (copper/iron based), ceramic cookies and annular ring clutch discs and matching cover assemblies				
Objectives in brief: Design and development of clutch discs and matching cover assemblies for automobiles.					
Original cost	₹ 21.64 crore	Expenditure	₹ 20.40 crore	Cost overrun	Nil
Project started	March 2008	Project closed	September 2011	Original duration	36 months
				Time overrun	6 months
Patents	0	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: Though the products were developed and identified for further development and commercialisation, no agreement was signed for transfer of technology. Further, company defaulted in repayment of the loan provided under the project.					

Name of Project: 3	Development of versatile, portable PC based software for bio-informatics and Development of Linux cluster version of Bio-suite.				
Objectives in brief: Development of a set of software tools that would assist the Indian academic, R&D institutions and Industry in the field of bio-informatics					
Original cost	₹ 17.02 crore	Expenditure	₹ 16.20 crore	Cost overrun	Nil
Project started	March 2002	Project closed	March 2005	Original duration	24 months
				Time overrun	12 months
Patents	0	Technology developed	Yes	Premia	Nil
		Commercialised	Yes	Royalty	₹ 1.21 lakh
Audit Comments: One component 'Metabolic Pathway Engineering' did not lead to any software and other softwares 'BioSuite' and 'Genocluster' developed under the project could generate a meagre royalty.					

continued on page-50

³⁵ Not applicable

Table 18: Projects in which envisaged objectives were not achieved

Sl. No.	Name of the project	Remarks
1.	Lactic acid and lactic acid based polymers- Establishment of a 300TPA plant for lactic acid production	The process developed did not meet the envisaged criteria. The project was eventually closed terming it as commercially unviable due to price escalation of cane juice and certain key chemicals.
2.	Oral delivery of insulin	The industrial partner withdrew from the project as formulation developed did not work.
3.	Wireless Sensor Network chip-set based Ultra Wide Band Technology.	During implementation of the project, the industrial partner expressed lack of expertise in executing some of the deliverables of the project, such as development of RF chips. Further, the technology was surpassed by other cost competitive technologies.
4.	Process of Tamiflu-a blockbuster drug to combat the menace of avian flu.	Process of development of Tami flu was already patented. The project partners failed to develop the non-infringing process of Tamiflu due to scientific hurdles and work was stalled at different stages. Further, no Government agency had ever requested CSIR to develop the drug.
5.	Microbiological conversion of Erythromycin to Clarithromycin and other novel biologically active molecules	The project could not achieve the envisaged objective as no positive leads could be obtained.
6.	Nano-material catalysts and associated process technology for alkylation / acylation reactions, pre-reforming of hydro-carbons, sulphur removal from petroleum fuels and natural gas combustion	The Acylation and Nitration components were foreclosed as they were not likely to lead to technology development/ commercial application and viability issues. Under the De-sulpherization of diesel component the catalyst developed could not meet the requirement of a commercial DHDS processes.

CSIR accepted (May 2015) the audit observation regarding non-achievement of objectives.

(b) In remaining 24 projects, objectives of the projects could not be fully achieved. Major reasons for partial achievement of objectives were scientific and technical hurdles/lack of technical expertise which could not be resolved (five³⁶ projects), disinterested industry partners (10³⁷ projects), technical/ commercial

³⁶ (i) Versatile, portable PC based software for bio-informatics and development of Linux cluster version of bio-suite; (ii) Improved granular processing towards energy efficiency and resource conservation in cement manufacture; (iii) Two orders of magnitude improved liquid crystals for flat panel display devices; (iv) Development of Novel Fungicides; and (v) Development of a 500 kW low cost horizontal-axis wind turbine.

³⁷ (i) Recombinant approach to produce α -linolenic acid and docosahexanoic acid (DHA) in sunflower and yeast; (ii) Development of Next Generation Plasma Display Technology and a 50" High Definition (HD) TV prototype; (iii) Biodegradable plastics from agricultural wastes–Cellulose esters based on bagasse; (iv) Novel Expression System; (v) Environmentally secure rare earth based colorants for surface coatings (Phase-II); (vi) Biotechnological Approaches for improvement of Plant Species with special reference to Pulp and Paper; (vii) Functionalization of Alkanes; (viii) Development of selected Medical Implants; (ix) Design and development of cushion bonded organic ceramic clutch discs; and (x) A prospective study to correlate gene signatures with clinical outcome of astrocytomas and identification of potential therapeutic target(s)

Brief profile of 30 selected projects (continued)

Name of Project: 4 Biotechnology for leather towards cleaner processing – Phase II					
Objectives in brief: Development of integrated technology packages for bio-processing of leather; technologies to obtain high value products from process waste and exploring/ developing eco-compatible and biodegradable leather.					
Original cost	₹ 14.21 crore	Expenditure	₹ 9.87 crore	Cost overrun	Nil
Project started	January 2006	Project closed	January 2012	Original duration	36 months
				Time overrun	36 months
Patents	1	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: The processes for enzymatic de-hairing, de-fleshing/degreasing and fibre opening were developed but could not be commercialized due to inaction by CSIR-CLRI and technology being economically unviable. Integrated technology packages could not be developed under the project as envisaged.					

Name of Project: 5 Development of globally competitive 'Triple-play' broadband technology					
Objectives in brief: Manufacture of a proven commercialisable technology with basic TV and PC-Centric services demonstrated in a network of 5,000 active customers in A-Class city like Pune.					
Original cost	₹ 11.89 crore	Expenditure	₹ 11.78 crore	Cost overrun	Nil
Project started	March 2005	Project closed	September 2007	Original duration	18 months
				Time overrun	12 months
Patents	0	Technology developed	Yes	Premia	Nil
		Commercialised	Yes	Royalty	₹ 1.38 lakh
Audit Comments: Though the technology was developed, the company could demonstrate it for only 330 connections in Pune city against the targeted 5,000 active connections.					

Name of Project: 6 Lactic acid and lactic acid based polymers – Establishment of a 300 TPA pilot plant for lactic acid production					
Objectives in brief: Establishment of a 300 tons per annum pilot plant at a suitable commercial location for production of lactic acid, based on laboratory scales data.					
Original cost	₹ 9.45 crore	Expenditure	₹ 9.27 crore	Cost overrun	Nil
Project started	March 2007	Project closed	August 2012	Original duration	36 months
				Time overrun	29 months
Patents	1	Technology developed	No	Premia	N/A
		Commercialised	N/A	Royalty	N/A
Audit Comments: Project faced engineering problems in the area of lactic acid purification and process operation. It was stated that further investment of ₹ six to eight crore was required for resolving these problems, which was not agreed to. Further, there was price escalation of cane juice and certain key chemicals. The project was closed as it became unviable.					

continued on page-52

un-viability (seven³⁸ projects), emergence of new technology in the market and violation of agreement (two³⁹ projects).

Thus, out of 30 projects scrutinised in audit, in six projects, objectives were not achieved at all and in 24 projects objectives were partially achieved. No project could achieve its objectives fully.

4.1.3.2 Management of Intellectual Property Rights/technologies generated under the scheme

According to NMITLI guidelines, CSIR was to facilitate the procedure for securing Intellectual Property Rights (IPR) for the technologies and processes generated from the projects, as well as to ensure commercial exploitation of the same. Out of 30 projects, a total of 86 patents (including one on design) were filed under 17 projects, of which 43 patents were granted.

4.1.3.3 Transfer of Technology

NMITLI guidelines provided that lead industrial partner should be offered the first right to utilise the IPRs/technologies by CSIR. The other industrial partner(s) also have option to get the license of technology/IPR out of the project from leading industrial partner(s). However, CSIR was free to offer the IPR to other firms in the event that the industrial partner did not take effective steps to commercially exploit the IPRs/technology within six months of exercising the option.

(i) Commercialisation of technology

Though technologies and processes⁴⁰ were developed in 24 out of 30 selected projects, they were transferred in only eight projects. Of eight

³⁸ (i) Development of globally competitive 'Triple Play' Broadband Technology; (ii) 5 & 25 kW decentralized power packs; (iii) Defunctionalization of carbohydrates as a feed stock to manufacture well identified industrial chemicals; (iv) Novel molecular diagnostics for Eye Diseases and Low Vision Enhancement Devices; (v) A cost effective Simple Office Computing (SofComp) platform to replace PC; (vi) Market seeding of SofComp and Mobilis to develop wide ranging applications as well as increase awareness; and (vii) Biotechnology for replacing chemical process in leather sector (Phase-II).

³⁹ (i) Nano material coatings and advanced composites for tribological applications in automotive industry; and (ii) A PC based high end 3D visualization platform for computational biology – 'Darshee'.

⁴⁰ Bio-process for leather processing, technology package for conversion of sugarcane bagasse into biodegradable material, identification of chemical/genetic leads and compounds, diagnostic kits for eye infection, bio-informatics software, technology for production of DHA and low cost embedded computing platforms, GUI based software for cement kilns, rare earth based colorants, technology for display devices, IP TV with PC-centric services, medical implants, design of wind turbine, LPG based power packs, surface coatings for automotive applications.

Brief profile of 30 selected projects (continued)

Name of Project: 7 & 8		A cost effective Simple Office Computing (Sofcomp) platform to replace PC; Market seeding of SofComp & Mobilis to develop wide-ranging applications as well as increase awareness			
Objectives in brief: Development of low cost (around ₹ 10,000 for base model and below ₹ 26,000 for advanced), embedded computer platform to replace conventional PCs alongwith advanced model having latest features; production of at-least 3000 units of 3 variants of SofComp, Mobilis STN and Mobilis TFT for market seeding to customize and increasing awareness of the product(s) towards catalyzing market(s).					
Original cost		₹ 3.30 crore ₹ 5.37 crore	Expenditure		₹ 3.20 crore ₹ 6.71 crore
				Cost overrun	Nil ₹ 1.34 crore
Project started	April 2003	Project closed	May 2005 December 2007	Original duration	21 months
	December 2005			Time overrun	29 months
Patents	0	Technology developed	Yes	Premia	Nil
		Commercialised	Yes	Royalty	Nil
Audit Comments: Post-NMITLI activities, such as market seeding, were not approved during 10 th plan and were subsequently incorporated in to the scheme from 11 th plan only. Therefore, approval of this activity was in violation of the CCEA approved guidelines. Further, the developed product did not find any buyer. The company failed to repay loans provided for both development and market seeding of the platforms.					

Name of Project: 9		Nano-material coatings and advanced composites for tribological applications in automotive industry			
Objectives in brief: Development of antifriction surface coatings (cast iron/AL/AL Alloys/hybrid) with reduced friction and improved wear resistance for automotive and engineering components.					
Original cost		₹ 7.54 crore	Expenditure		₹ 4.78 crore
				Cost overrun	Nil
Project started	April 2003	Project closed	March 2007	Original duration	36 months
				Time overrun	12 months
Patents	1	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: Technology developed was not commercialisable due to high capital cost besides change in sub-system design of the components manufactured/used by the industrial partner. CSIR did not make efforts to commercialise/transfer the technology to any other industry.					

Name of Project: 10		Functionalization of Alkanes			
Objectives in brief: To develop economical process for production of various acids and novel processes for Indian Petrochemical Industry.					
Original cost		₹ 6.75 crore	Expenditure:		₹ 5.00 crore
				Cost overrun	Nil
Project started	April 2003	Project closed	November 2006	Original duration	24 months
				Time overrun	20 months
Patents	8	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: Out of four components taken up under the project, three were found to be economically unviable, and in one case, the productivity was not as per the international level.					

continued on page-54

projects in which technologies were transferred, the same could be commercialised in only four⁴¹ projects. Technologies from remaining four projects were not commercialised even after six to nine years of their transfer as shown in Table 19.

Table 19: Technologies not commercialised in spite of transfer

Sl. No.	Name of the project	Expenditure (₹ in crore)	Date of completion/closure	Date of transfer of technology	Time lapse as of March 2014
1.	Recombinant approach to produce a-linolenic acid docosahexanoic acid (DHA) in sunflower and yeast	3.72	July 2007	July 2007	7 years
2.	A cost effective simple office computing (SofComp) platform to replace PC	3.20	May 2005	May 2005	9 years
3.	Market seeding of SofComp & Mobilis to develop wide-ranging applications as well as increase awareness	6.71	December 2007		
4.	Biodegradable polymers from agricultural wastes: cellulose esters based on Bagasse derived cellulose	2.87	December 2004/March 2008	July 2008	6 years

In the above projects, industrial partner was unable to commercialise the technology/ products. CSIR accepted the observations. CSIR did not explore the possibility of commercialisation of these technologies by finding other capable companies.

In remaining 16 projects, technologies/processes/ know-how developed could not be transferred to industries for commercialisation for reasons such as disinterest/discontinuance of industrial partners (eight⁴² projects), commercial unviability (three⁴³ projects), lack of expertise (two⁴⁴ projects) and technical hurdles, emergence of new technology (three⁴⁵ projects).

⁴¹ (i) Development of globally competitive 'Triple Play' Broadband Technology; (ii) Versatile, portable PC based software for bioinformatics and development of Linux cluster version of Bio-Suite; (iii) Novel Molecular Diagnostics for eye diseases and Low vision enhancement devices; and (iv) A PC based high-end 3D visualization platform for computational biology – 'Darshee'

⁴² (i) Development of Next Generation Plasma Display Technology and a 50" High Definition (HD) TV prototype; (ii) Novel Expression System; (iii) Environmentally secure rare earth based colorants for surface coatings (Phase-II); (iv) Biotechnological approaches for improvement of plant species with special reference to pulp and paper; (v) Functionalization of Alkanes; (vi) Development of selected medical implants; (vii) Design and development of cushion bonded organic ceramic clutch discs; and (viii) A prospective study to correlate gene signatures with clinical outcome of astrocytomas and identification of potential therapeutic target(s)

⁴³ (i) 5 and 25 KW decentralized power packs; (ii) Defunctionalization of carbohydrates as a feed stock to manufacture well identified industrial chemicals; and (iii) Biotechnology for replacing chemical process in leather sector-Phase II

Brief profile of 30 selected projects (continued)

Name of Project: 11		Development of selected Medical Implants			
Objectives in brief: Development of normal and drug eluting cardiovascular stents, spinal/hip/dental implants with specific characteristics.					
Original cost	₹ 6.60 crore	Expenditure	₹ 7.71 crore	Cost overrun	₹ 1.11 crore
Project started	April 2005	Project closed	May 2012	Original duration	36 months
				Time overrun	48 months
Patents	0	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: The Monitoring committee (May 2010) felt that development of implants takes 8-10 years, therefore no product could be developed to the level of commercialisation. The project was therefore, poorly formulated in terms of its duration. Objectives could not be achieved due to reasons such as disinterest shown by clinical partner in case of spinal implants and inadequate monitoring of progress of the project by both the committees of CSIR. However, trials were ongoing in respect of dental implants only.					

Name of Project: 12		5 & 25 KW decentralized power packs			
Objectives in brief: Development of 5 kW fuel cell power packs delivering 200 volts by using methanol, LPG and ethanol from sugar factories; development of Proton Exchange Membrane (PEM) fuel cell at ₹ 50,000 per kW and development of 25 kW systems for commercial application.					
Original cost	₹ 6.10 crore	Expenditure	₹ 6.21 crore	Cost overrun	₹ 0.11 crore
Project started	March 2001	Project closed	June 2004	Original duration	24 months
				Time overrun	15 months
Patents	0	Technology developed	No	Premia	N/A
		Commercialised	N/A	Royalty	N/A
Audit Comments: Prototype demonstrated under the project was based only on LPG, as work on methanol and ethanol based technology was not taken up. Further, development of 25 kW systems was not taken up due to non-achievement of cost economy in production of PEM fuel cell.					

Name of Project: 13		Development of Novel Fungicides			
Objectives in brief: To develop commercially viable and environmentally safe novel fungicides.					
Original cost	₹ 5.54 crore	Expenditure	₹ 4.59 crore	Cost overrun	Nil
Project started	October 2004	Project closed	March 2008	Original duration	36 months
				Time overrun	6 months
Patents	0	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: Leads identified under the project could not be developed as commercialisable products due to lack of expertise available in the country. Audit also noted that doubts were raised during techno-economic and financial viability evaluation of the project in view of poor track record in the earlier projects of the industrial partner.					

continued on page-56

⁴⁴ (i) Two orders of magnitude improved liquid crystals for flat panel display devices; and (ii) Development of Novel Fungicides

⁴⁵ (i) Improved granular processing towards energy efficiency and resource conservation in cement manufacture; (ii) Nano-material coatings and advanced composites for tribological applications in Automotive Industry; and (iii) Development of a 500 Kw low cost horizontal-axis Wind Turbine

Thus, of 30 projects seen in audit, technologies developed were translated into commercial activity/end use in only four projects.

4.1.3.4 Non-compliance to NMITLI Guidelines

With a view to execute the projects in an efficient and effective manner to achieve their envisaged objectives/deliverables, CSIR formulated (January 2003) NMITLI guidelines outlining the procedures to be followed for sanction, funding and implementation of the projects within stipulated time. Audit observed violation of NMITLI guidelines in 12 projects on issues such as projects awarded to ineligible industrial participants, financial violations such as incorrect re-appropriations, non-accounting of interest earned, revision of project cost without obtaining requisite approvals, etc.

(i) Violation of Project Formulation Guidelines

The violation of project formulation guidelines was found in six projects. In five⁴⁶ projects, it was observed that there was violation of project formulation guidelines such as, the project proposal was neither taken in screening committee nor discussed in Expert Group/High Power Committee, inadequate presence of only one field expert in Champions Group against the mandated three-four experts, sanction of project for market seeding for post NMITLI activities and approval of project even after negative view on Techno-economic and financial viability evaluation report. In one⁴⁷ project, the industrial partner did not fulfil the condition of having DSIR recognition as R&D lab within the prescribed period of 12 months.

(ii) Violation of Operational Guidelines

There was violation of operational guidelines of scheme in six⁴⁸ projects which included unapproved re-appropriation of funds in two projects,

⁴⁶ (i) Process for Tamiflu—a blockbuster drug to combat the menace of avian flu; (ii) Two orders of magnitude improved Liquid Crystals for flat panel display devices; (iii) Market seeding of SofComp and Mobilis to develop wide ranging applications as well as increase awareness; (iv) Development of Novel Fungicides; and (v) Development of a 500 KW low cost horizontal-axis wind turbine

⁴⁷ Recombinant Approach to produce α -linolenic acid docosahexanoic acid (DHA) in sunflower & yeast

⁴⁸ (i) Development of next generation Plasma Display Panel technology and 50" High Definition (HD) TV Prototype; (ii) 5 and 25 KW Decentralized power packs; (iii) Wireless Sensor Network chipset based Ultra Wide Band (UWB) technology; (iv) Design & Development of Environmentally secure earth based colorants for surface coating applications (Phase-II); (v) Biotechnical approaches for improvement of plant species with special reference to pulp and paper; and (vi) Novel molecular diagnostics for eye diseases and low vision enhancement devices.

Brief profile of 30 selected projects (continued)

Name of Project: 14		Nano-material catalysts and associated process technology for alkylation/acylation reactions, pre-reforming of hydro-carbons, sulphur removal from petroleum fuels and natural gas combustion			
Objectives in brief: Development of commercially viable nano-particle catalyst systems and processes related to various applications in fine chemical industry.					
Original cost	₹ 5.52 crore	Expenditure	₹ 5.61 crore	Cost overrun	₹ 0.09 crore
Project started	March 2001	Project closed	June 2006	Original duration	24 months
				Time overrun	39 months
Patents	0	Technology developed	No	Premia	N/A
		Commercialised	N/A	Royalty	N/A
Audit Comments: The project failed to provide any technology for commercial applications due to various technical reasons, despite incurring expenditure in excess of estimated cost of the project.					

Name of Project: 15		Development of a 500 kW low cost horizontal-axis Wind Turbine			
Objectives in brief: Design and development of a 500 kW low cost, indigenous, horizontal-axis wind turbine specially suited for the Indian climatic conditions.					
Original cost	₹ 5.27 crore	Expenditure	₹ 8.99 crore	Cost overrun	₹ 3.72 crore
Project started	March 2004	Project closed	December 2010	Original duration	24 months
				Time overrun	57 months
Patents	0	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: Wind turbine controls and safety system were assembled and installed around an imported Danish 'Orbital' Controller for which the industrial partner was sole Indian Agent. The output generated during field trials was limited from 16 to 376 kW only. There was cost overrun of more than 70 per cent as well as time overrun.					

Name of Project: 16		Biotechnical approaches for improvement of plant species with special reference to pulp and paper			
Objectives in brief: Development of pulpwood species with low or altered lignin content and high cellulose content by exploiting the genetic diversity of the target plants.					
Original cost	₹ 4.97 crore	Expenditure	₹ 7.17 crore	Cost overrun	₹ 2.20 crore
Project started	October 2004	Project closed	March 2008	Original duration	24 months
				Time overrun	18 months
Patents	0	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: Despite identification of three germ plasms, no new pulp wood species could be developed as industry involved did not pursue them further.					

continued on page-58

interest earned by institutional partner not accounted for under one project, incurring of expenditure after closure of the projects, improper rescheduling of repayment of loan and non-signing of fresh agreement for loan repayment after expiry of the earlier agreement in one project each.

Thus, the project formulation and operational guidelines, prepared to accomplish the objectives and attainment of overall objectives of the scheme in a time bound and systematic manner, were violated due to weak internal control mechanism at CSIR level.

4.1.3.5 Monitoring of projects

(i) Meetings of the internal Steering Committee and Monitoring Committee not held regularly

The NMITLI Scheme provided for two tier monitoring system to ensure realisation of objectives and deliverables. At the first level was an internal Steering Committee (SC) comprising Project Investigators (PIs) who were required to meet once in three months. At the second level there was an external independent Monitoring Committee (MC) comprising three eminent experts who were to meet at least once in six months. MC was responsible for recommending

- (i) foreclosure or modification of the projects or sub-components;
- (ii) inclusion of additional institutional/industrial partners wherever necessary; and
- (iii) revising the funding support to implementing partners.

Audit scrutiny revealed that meetings of the SCs/MCs were not held regularly as per the prescribed duration, which not only resulted in inadequate monitoring but also affected the progress of project activities. The position of shortfall in meetings of SC and MC is given in Table 20.

Table 20: Number of meetings of Monitoring Committee and Steering Committee held

Percentage of shortfall	Number of projects	
	Monitoring Committee	Steering Committee
No shortfall	12	2
1 to 25 per cent	10	7
26 to 50 per cent	7	13
51 to 75 per cent	Nil	4
76 to 99 per cent	Nil	Nil
100 per cent	1	4
Total Number of Projects	30	30

It can be seen from the above table that there was shortfall in conducting regular meetings of Monitoring Committee for assessment of project activities. The shortfall

Brief profile of 30 selected projects (continued)

Name of Project: 17		Improved granular processing towards energy efficiency and resource conservation in cement manufacture			
Objectives in brief: Development of new technologies to improve the energy efficiency of the cement manufacturing process.					
Original cost	₹ 4.87 crore	Expenditure	₹ 3.22 crore	Cost overrun	Nil
Project started	March 2002	Project completed/ closed	March 2006	Original duration	36 months
				Time overrun	12 months
Patents	3	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: The project was left incomplete midway due to inadequate duration, simulation work not taken up with Information Technology and cement industry and institutional partner's work not taken to pilot level with industry. The project could develop easy to use graphical user interface based software called ROCKS (Rotary Cement Kiln Simulator) and individual mathematical models for kiln, calciner, pre-heaters and clinker. However, no new technology as envisaged for benefit of cement industry could be developed.					

Name of Project: 18		A prospective study to correlate gene signatures with clinical outcome of astrocytomas and identification of potential therapeutic target(s)			
Objectives in brief: Validation and characterisation of selected genes for glioma ⁴⁹ progression besides development of diagnostic microchip and potential therapeutic markers.					
Original Cost	₹ 4.77 crore	Expenditure	₹ 5.46 crore	Cost overrun	₹0.69 crore
Project started	January 2006	Project closed	March 2011	Original duration	48 months
				Time overrun	15 months
Patents	0	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: The products were not commercialised despite development of technologies due to discontinuation of the Industrial partner.					

Name of Project: 19		Wireless Sensor Network Chipset based Ultra Wide Band (UWB) technology.			
Objectives in brief: Development of a Wireless ultra-wide band RF-sensor chipset to provide strategic advancement in wireless communication for capturing the market in home security and retail market sector.					
Original cost	₹ 4.60 crore	Expenditure	₹ 4.02 crore	Cost overrun	Nil
Project started	March 2007	Project closed	June 2013	Original duration	36 months
				Time overrun	39 months
Patents	0	Technology developed	No	Premia	N/A
		Commercialised	N/A	Royalty	N/A
Audit Comments: Although the company demonstrated a prototype, commercial viability of the project/product could not be established, as there were no standards for ultra-wide technology products. Due to this, product developed under the project could not be tested.					

continued on page-60

⁴⁹ Several brain tumor types grouped together under the name glioma

ranged from one to 50 *per cent* in 17 projects. Similarly, in respect of meetings of SC, there was shortfall in conducting the meetings in 28 projects. The shortfall ranged from one to 75 *per cent* in 24 projects. In one project viz. 'Process for Tamiflu—a blockbuster drug to combat the menace of avian flu', MC as well as SC was not constituted. In three other projects, no meeting of SC was conducted. The project wise details of number of meetings held are given in **Appendix XVI**.

CSIR stated (January 2014/May 2015) that sometimes the monitoring schedule could not be adhered to due to several reasons including non-achievement of scheduled milestones within prescribed time-frame besides non-availability of experts.

The reply is to be seen in the context that necessity of closer monitoring of projects in the event of non-achievement of scheduled milestones was more important.

(ii) Time Overruns

Out of 30 projects sampled in audit, Audit observed delays in implementation of projects in 28 projects, with time overrun ranging from six months to nearly five years as detailed in **Appendix XVII**.

CSIR accepted audit observations and stated (January 2014) that GB/DG, CSIR was empowered to approve the time overrun. Audit however observed that there was time over-run in more than 93 *per cent* of sampled projects which shows inadequate allotment of time at project approval stage.

(iii) Non-compliance with directives given by Committees

Audit observed that in three projects, specific recommendations given by the committees during review of progress of the projects were not complied with by the project partners. Details are given in Table 21.

Brief profile of 30 selected projects (continued)

Name of Project: 20	Design and development of environmentally secure rare earth based colorants for surface coating applications (Phase-II)				
Objectives in brief: Development and standardisation of the technologies/process for range of colours based on rare earth compounds viz. brown, green and blue.					
Original cost	₹ 3.96 crore	Expenditure	₹ 2.12 crore	Cost overrun	Nil
Project started	March 2005	Project closed	December 2008	Original duration	36 months
				Time overrun	9 months
Patents	0	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: The project could develop only two colour pigments i.e. brown and yellow, against the targeted range of colours. However only brown colour was taken up for up-scaling by the industrial partner.					

Name of Project: 21	Biodegradable plastics from agricultural wastes: Cellulose esters based on bagasse derived cellulose				
Objectives in brief: Development of biodegradable materials from renewable agricultural byproducts viz. sugarcane bagasse, straws and stalks of food crops, etc., along with validation at pilot scale level (in continuous process mode of 100 Kg) with industry.					
Original cost	₹ 2.00 crore + ₹ 1.50 crore	Expenditure	₹ 2.87 crore + ₹ 1.34 crore	Cost overrun	₹ 0.87 crore
Project started	March 2002 March 2005	Project closed	December 2004 March 2008	Original duration	48 months
				Time overrun	21 months
Patents	1	Technology developed	Yes	Premia	₹ 1.50 crore
		Commercialised	No	Royalty	Nil
Audit Comments: The pilot plant was made operational on batch processing of 20 Kg each instead of envisaged continuous process mode of 100 Kg and no biodegradable material/product was developed and validated in the market after transfer of technology in July 2008.					

Name of Project: 22	Novel molecular diagnostics for eye diseases and low vision enhancement devices (Phase-I & II)				
Objectives in brief: Development of molecular diagnostic devices for eye diseases and vision enhancing devices.					
Original cost	₹ 3.39 crore	Expenditure	₹ 4.96 crore	Cost overrun	₹ 1.57 crore
Project started	April 2003	Project closed	April 2007	Original duration	24 months
				Time overrun	25 months
Patents	1	Technology developed	Yes	Premia	Nil
		Commercialised	Yes	Royalty	₹ 6.84 lakh
Audit Comments: The work on cataract and glaucoma could not be taken up due to insufficient data generation. Besides this, the products developed under the project were found to be costly which affected commercial viability.					

continued on page-62

Table 21: Non-compliance with recommendations of Monitoring/Steering Committees

Sl. No.	Name of the project (Expenditure in ₹ crore)	Recommendations of the committee not followed
1.	Wireless Sensor Network chipset based Ultra Wide Band (UWB) technology (₹ 4.22 crore)	The industrial partner presented marketing strategy to enter a niche market viz. video surveillance with high data rates which was not included in the original project work. Consequently, MC recommended (February 2008) that the industry partner collaborate with another industry (Mindtree). However, the opportunity was not utilised by the industrial partner. Besides this, the company did not participate in CES 2009 for showcasing its prototype, as recommended by the Committee (April 2009), as the preparations were not complete.
2.	Improved Granular Processing towards energy efficiency and resource conservation in Cement Manufacture (₹ 3.22 crore)	MC while closing the project recommended (April 2006) NML ⁵⁰ to initiate scale up studies at Pilot Plant level in association with cement industry involving TIFAC-fly ash mission and other stakeholder(s). However, no action was taken by NML in this regard.
3.	Design and Development of Environmentally secure rare earth based colorants for surface coating applications (Phase-II) (₹ 2.12 crore)	The Steering Committee recommended (December 2008) that CSIR may explore the possibilities in consultation with IIT-Chennai to up-scale the process of band gap engineering developed for gamma cerium sulfide. Similarly CLRI was also advised to up-scale the mixed rare earth pigments through IREL. However, only brown pigment could be taken up for up-scaling by IREL and other products were yet to be up-scaled.

(iv) Default in repayment of loan by industrial partners

NMITLI scheme envisaged provision of soft-loans to industrial partner in IOP projects, at the rate of three *per cent* per annum for development of technologies repayable along with interest in 10 equal annual instalments. Terms and conditions of grant of loan to industrial partners provided for imposition of penal interest at the rate 12 *per cent* compounded monthly for the period of delay, in case of delay in repayment of loan by the industrial partner. Initially, NMITLI guidelines had a provision for techno-economic viability assessment of project partners during selection of the NMITLI projects. The process involved referring project proposals of industry originated projects to technology funding agencies/VCF/Banks for assessing the financial profile of the industry partner and techno-economic viability of the project. This clause was, however, removed (July 2004) from guidelines by the Governing Body of CSIR.

In respect of 30 projects selected in audit, loan of ₹ 83.02 crore was released to 18 companies, of which principal amount of ₹ 64.92 crore in nine projects was under default, as shown in Table 22. In addition, interest of ₹ 67.97 crore was also due towards loans released under these projects.

⁵⁰ National Metallurgical Laboratory, Jamshedpur (a constituent laboratory of CSIR)

Brief profile of 30 selected projects (continued)

Name of Project: 23		Recombinant approach to produce a-linolenic acid docosahexanoic acid (DHA) in sunflower and yeast			
Objectives in brief: Production of DHA by various processes of fermentation.					
Original cost	₹ 3.26 crore	Expenditure	₹ 3.72 crore	Cost overrun	₹ 0.46 crore
Project started	April 2003	Project closed	July 2007	Original duration	36 months
				Time overrun	16 months
Patents	1	Technology developed	Yes	Premia	₹ 50 lakh
		Commercialised	No	Royalty	Nil
Audit Comments: Though the objective for production of DHA from fermentation was achieved, the industrial partner did not commercialise the technology. Besides, industrial partner also defaulted in repayment of loan.					

Name of Project: 24		Oral Delivery of Insulin			
Objectives in brief: Development of oral insulin capsule for treatment of diabetic patients.					
Original cost	₹ 2.87 crore	Expenditure	₹ 2.39 crore	Cost overrun	Nil
Project started	June 2004	Project closed	April 2012	Original duration	36 months
				Time overrun	57 months
Patents	1	Technology developed	No	Premia	N/A
		Commercialised	N/A	Royalty	N/A
Audit Comments: Project could not develop desired formulations due to various technical issues viz. lack of product standardisation, drug loading problems, lack of positive clinical response, etc., even after a long time over-run of 57 months. Subsequently, industrial partner lost interest in the project.					

Name of Project: 25		Defunctionalization of carbohydrates as feed stock to manufacture industrial chemicals			
Objectives in brief: Development of economically feasible methods and processes towards industrially important commodity chemicals and specialty chemicals for textile, automobile and other such industries.					
Original cost	₹ 2.50 crore	Expenditure	₹ 2.52 crore	Cost overrun	₹ 0.02 crore
Project started	March 2001	Project closed	April 2004	Original duration	24 months
				Time overrun	13 months
Patents	2	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: Various components under the project were closed midway due to technical reasons, without achieving envisaged objectives. The accomplishment was limited to only one component, which also could not be commercialised as one of the chemicals was found to have mutagenic properties and had to be withdrawn.					

continued on page-64

Table 22: List of projects under which loans released to private partner were under default as of 31 March 2014(*₹ in crore*)

Sl. No.	Project Name	Name of Industrial partner	Amount of loan released	Date of repayment due	Outstanding Principal amount	Outstanding interest
1	Versatile, portable PC based software for bioinformatics; and Development of Linux cluster version of Bio-suite	Jalaja Technology, Bengaluru	0.24	October 2005	0.10	0.58
		Frontier Information Technologies Ltd., Secunderabad	0.40	April 2008	0.14	0.73
2	Value added polymeric materials from renewable resources: Lactic acid and lactic acid based polymers	Godavari Sugar Mills, Mumbai	4.85	April 2012	4.85	1.36
3	Recombinant approach to produce α -linolenic acid and docosahexanoic acid (DHA) in sunflower and yeast	Avestha Gengraine Technology Pvt. Ltd., Bengaluru	3.04	January 2008	2.73	0.92
4	A cost effective Simple Office Computing (Sofcomp) platform to replace PC	Encore Software Limited, Bengaluru	3.20	November 2005	2.56	3.28
5	Development of Globally competitive 'Triple-Play' Broadband Technology	DiviNet Access Technologies Ltd., Pune	9.39	March 2008	9.39	10.19
6	Market seeding of SofComp and Mobilis to develop wide-ranging applications as well as increase awareness	Encore Software Limited, Bengaluru	5.37	March 2007	5.37	3.29
7	Development of Next Generation Plasma Display Technology a 50" High Definition (HD) TV Prototype	Samtel Color, Ghaziabad	20.63	October 2010	20.63	23.18
8	Development of sensor networks chipset based on ultra-wide band technology	Virtual Wire Technology, New Delhi	4.22	August 2010	4.22	1.13
9	Design and development of cushion bonded/rigid bonded organic, cerametallic cookie & single/fuel sintered buttons (copper/Iron based), ceramic cookies and annular ring clutch discs and matching cover assemblies	Clutch Auto Ltd., Faridabad	14.93	April 2012	14.93	23.31
TOTAL			66.27		64.92	67.97

Brief profile of 30 selected projects (continued)

Name of Project: 26		Development of Novel Expression System			
Objectives in brief: Development of an indigenous expression system for Indian Bio-pharmaceutical sector for expression of proteins for diverse applications.					
Original cost	₹ 2.16 crore	Expenditure	₹ 2.55 crore	Cost overrun	₹ 0.39 crore
Project started	March 2005	Project closed	September 2008	Original duration	36 months
				Time overrun	6 months
Patents	0	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: Expression systems could not be developed. Further, two industrial partners abandoned the project due to change of ownership and mandate of intellectual property proposed to be utilised for development of the system.					

Name of Project: 27		A PC based high-end 3D visualization platform for computational biology – 'Darshee'			
Objectives in brief: Development of a software tool for extending capability and functionality of existing software packages in the market (<i>viz. BioSuite, BioSPICE of TCS developed under NMITLI</i>) to facilitate and aid bio-informatics and bio-simulation for research in the pharmaceutical and biotechnology sector.					
Original cost	₹ 1.93 crore	Expenditure	₹ 1.97 crore	Cost overrun	₹ 0.04 crore
Project started	April 2003	Project closed	May 2004	Original duration	13 months
				Time overrun	--
Patents	0	Technology Developed	Yes	Premia	Nil
		Commercialised	Yes	Royalty	Nil
Audit Comments: The developed software was bundled and co-branded by the Industrial partner with a foreign product marketed by Strategene, California without obtaining the approval of CSIR, which did not exercise its first right of refusal as per terms and conditions of the project agreement. Thus, the project failed in its objective of technological advancement in India.					

Name of Project: 28		Two orders of magnitude improved Liquid Crystals for flat panel display devices			
Objectives in brief: Development of new technology to fabricate Liquid Crystal Displays (LCD) and introduction of new prototype devices based on the new technology.					
Original cost	₹ 1.40 crore	Expenditure	₹ 1.36 crore	Cost overrun	Nil
Project started	May 2001	Project closed	June 2005	Original duration	24 months
				Time overrun	24 months
Patents	4	Technology developed	Yes	Premia	N/A
		Commercialised	No	Royalty	N/A
Audit Comments: The project was closed with the view that neither the industry partner under the project nor invited industry representatives had necessary expertise to commercialise/develop it further.					

continued on page-66

CSIR, while accepting the facts, stated (August 2014) that legal action had been initiated against all the defaulters.

4.1.4 Observations on specific projects

Scrutiny of projects implemented under NMITLI scheme revealed instances of incomplete assessment of projects at proposal stage, which affected achievement of desired results under the projects after implementation. Some significant cases are discussed in the succeeding paragraphs.

4.1.4.1 Sanction of project without standards for testing specifications

CSIR sanctioned (March 2007) a project titled 'Development of chipset for wireless sensor networks based on ultra-wide band technology' to Virtual-Wire Technologies Ltd., New Delhi (VWT) at an estimated cost of ₹ 4.60 crore for duration of three years. Objective of the project was to develop a wireless chipset using ultra-wide band technology, for low-power and low data rate wireless communication applications. The technology was proposed as a cost effective solution to overcome problems of interference and high power consumption being faced by existing wireless chipsets that used conventional narrow band technology.

The project was to be implemented in three phases viz. design, development and commercialisation. It was envisaged that chipset would be made available for commercial use at end of the project. The chipset was expected to capture significant market in home security and retail sector, with expected returns of more than ₹ 300 crore. Under commercialisation phase, the industry partner also proposed to be involved in the process for standardisation of the developed product, to ensure that the technology was incorporated within global standards.

CSIR entered (March 2007) into an agreement with the firm for implementation of the project. According to the terms and conditions of the agreement, financial support of ₹ 4.60 crore was to be disbursed in the form of soft loan, to be re-paid in 10 annual instalments commencing from August 2010. Between March 2007 and July 2009, CSIR released ₹ 4.22 crore to the firm.

During course of the project (May 2008) , the firm proposed to upgrade project objectives from development of low data rate chipset to high data rate chipset on the justification that conventional wireless communication companies had overcome their problems, therefore proposed new technology was no longer cost competitive. Accordingly, Monitoring Committee (MC) of the project revised (August 2008)

Brief profile of 30 selected projects (continued)

Name of Project: 29		Microbiological conversion of Erythromycin to Clarithromycin and other novel biologically active molecules			
Objectives in brief:					
To find an alternative process that increases the yield with reduced number of steps and lesser cost for discovery of new generation antibiotics.					
Original cost	₹ 1.21 crore	Expenditure	₹ 1.04 crore	Cost overrun	Nil
Project started	September 2002	Project closed	April 2004	Original duration	20 months
				Time overrun	--
Patents	0	Technology Developed	No	Premia	N/A
		Commercialised	N/A	Royalty	N/A
Audit Comments:					
The project was closed after the envisaged duration of 20 months and incurring more than 85 per cent of the estimated cost as it was not leading to any new strain from the desired conversion.					

Name of Project: 30		Process of Tamiflu – a blockbuster drug to combat the menace of avian flu			
Objectives in brief:					
Indigenous process for development of drug 'Oseltamivir' commercially known as 'Tamiflu'.					
Original cost	₹ 50 lakh	Expenditure	₹ 39.53 ⁵¹ lakh	Cost overrun	Nil
Project started	October 2005	Project closed	October 2007	Original duration	10 months
				Time overrun	15 months
Patents	0	Technology developed	No	Premia	N/A
		Commercialised	N/A	Royalty	N/A
Audit Comments:					
Project was sanctioned in violation of the NMITLI guidelines for project formulation as the proposal was neither taken into Screening Committee nor discussed in Expert Group and High Power Committee. The process for development of Tamiflu was already patented and CSIR was unable to develop a non-infringing process. After the bird flu menace abated, CSIR closed the project.					

⁵¹ Of this amount, ₹ 37.50 lakh was released under NMITLI.

project objective without cost overrun as development and demonstration of working prototype with one Gbps data transfer rate to be delivered before July 2009. VWT was able to develop and demonstrate the working prototype only by July 2010. However, it was unable to establish its commercial viability, as standards for ultra wide-band technology products were yet to be adopted, due to which it was difficult to test whether prototype developed was as per specific standards or not.

Subsequently, during MC meeting (July 2010) the firm proposed to shift away from ultra-wide band technology standards to other existing standards. However, to achieve specifications under these standards, further work was required to be done, for which VWT did not possess necessary expertise. In view of this and the fact that the firm was unable to gather financial resources for commercialisation, the project was closed in March 2012 after incurring an expenditure of ₹ 4.02 crore. It was however, suggested (April 2012) to pursue securing intellectual property rights for the technology developed.

As of May 2015, standards for the technology were yet to be evolved and product was not exploited commercially. Although four patents were filed none were granted. Further, the firm failed to repay the entire loan amount of ₹ 4.22 crore. As of March 2014, interest of ₹ 1.13 crore was outstanding against the firm.

Audit observed that CSIR was aware at the time of evaluating the project proposal that standards for the proposed technology were not available.

Thus, CSIR took up a project in an area where no standards for product testing were available. Consequently, product developed could not be tested for its successful development and hence could not be exploited commercially. CSIR also delayed in taking action towards non-repayment of loan and thereby extended undue benefit to the firm.

CSIR stated (May 2015) that developments in the field could not be anticipated at the time of launch of the project. The reply of CSIR needs to be viewed in the background that projects sanctioned under NMITLI were expected to achieve technological leadership, which could not be affirmed in this case, as CSIR extended support to a project in which there were no standards available to test success of the same.

4.1.4.2 Hasty sanction of project

CSIR sanctioned (October 2005) a project on “Process for Tamiflu—a Blockbuster drug to combat the menace of avian flu” to be implemented by National Chemical Laboratory, Pune (NCL) with budget allocation of ₹ 25.00 lakh for duration of six months. The project was taken up in the background of the threat of bird flu pandemic in the country. CSIR aimed to develop the process for indigenous

production of Tamiflu drug used in treatment of bird flu, so as to become self reliant in drug production and stockpile sufficient quantity. As there was already a patented process for production of Tamiflu, CSIR took up the project to develop non-infringing process for development of the drug. The project was proposed with five components as follows:

- Development of process for Tamiflu using certain identified starting materials⁵²;
- Development of non-infringing process for Tamiflu;
- Development of raw materials from Indian plant sources;
- Development of bio-process for raw materials; and
- Development of new drugs.

It was decided to constitute Monitoring Committee for the project at the time of launch of the second component. Subsequently, Indian Institute of Chemical Technology, Hyderabad (IICT) another CSIR laboratory was also included (January 2006) as partner with additional allocation of ₹ 25.00 lakh.

NCL and IICT were however, unable to develop a non-infringing process for development of Tamiflu. The project was closed (October 2007) after incurring expenditure of ₹ 39.53⁵³ lakh. Though it was stated (October 2007) that some of the schemes had potential for commercial exploitation, no further work was done in this area.

Audit observed that the project was sanctioned in violation of project formulation guidelines of NMITLI, as project proposal was neither evaluated by screening committee nor discussed in Expert Group and HPC. There was no monitoring of the project, as MC was also not constituted. Further, though the objective was to become self sufficient in production of the drug in the event of a pandemic, the project was not carried further as of May 2015.

CSIR stated (July 2010) that the project was not continued as by that time, bird flu menace had passed. CSIR further stated (February 2013/May 2015) that due to looming emergency in respect of bird flu menace, NMITLI processes were bypassed for sanctioning the project. It was also stated that a process of Tamiflu production was developed under the project but Indian companies permitted by the government to produce generic version of the drug had got the process from abroad as a package from original manufacturer and the developed process could not be utilised.

⁵² Shikimic acid and Quinic acid

⁵³ Of this amount, ₹ 37.50 lakh was released under NMITLI.

Reply of CSIR is viewed in context of the justification given at the time of taking up the project that India needed to develop self-sufficiency in production of the drug to combat pandemic situations. The decision to discontinue work as the bird flu menace had passed by then trivialises this rationale. Further, CSIR was already aware at the project proposal stage that Indian companies had been permitted to produce generic version of the drug. Also, the process stated as developed by CSIR could not have been commercialised, as it had not been able to develop a non-fringing process.

Thus, CSIR took a hasty decision to implement the project without requisite preliminary screening of project proposal for technical feasibility, economic viability and monitoring mechanism, etc. Ultimately, project was closed down after the bird flu pandemic abated and no further work was done in the area, resulting in unfruitful expenditure of ₹ 39.53 lakh. The purpose to become self-sufficient in the event of threat of the disease was also defeated.

4.1.4.3 Unfruitful expenditure due to non-availability of users for technologies developed

Guidelines for preparation and approval of Project Proposals under NMITLI provided for constitution of a Specialist Expert Group (Champions Group) which would comprise of three to four experts in the relevant area with at least one of them being from industry to provide an industrial perspective to the project.

CSIR sanctioned (May 2001) a project titled 'Two orders of magnitude improved liquid crystals for flat panel display devices' at a total cost of ₹ 1.40 crore for duration of two years under NMITLI.

Objectives of the project were as follows:

- Development of new technology to fabricate Liquid Crystal Displays (LCD) with improved display characteristics;
- Optimisation of manufacturing process to make it cost effective;
- Synthesis of new materials to suit the requirement of developed concept; and
- Introduction of new prototype devices based on the new technology.

The project proposal envisaged that new technology developed would enable Indian industry to position itself critically in the area of LCD devices.

The project was to be implemented by Centre for Liquid Crystal Research Bengaluru (CLCR)⁵⁴ and Bharat Electronics Ltd., Bengaluru (BEL). Accordingly, CSIR entered (May

⁵⁴ An autonomous research institution under Department of Science and Technology

2001) into MoU with CLSR and BEL. Financial support by CSIR was in the form of grant-in-aid to the two implementing agencies.

The project was extended for one year upto March 2004. Though the project objectives were achieved and a prototype was developed, BEL expressed inability to commercially exploit the new product. Therefore, MC recommended (August 2004) that a new industrial/institutional partner be involved in the project for further development of prototypes and identification of industrial partners for its commercial exploitation. MC recommended extension of the project till June 2005.

CSIR organised (February 2005) a meeting with Indian industry, in which two new technologies developed under the project were introduced to representatives of three companies and their inputs sought on commercial exploitation of the same.

It however, emerged that none of the invited industries were ready to take the technology, as they lacked competence to build such prototypes. Finally, it was concluded (June 2005) that the project may be closed and foreign parties be identified which could convert the technology into products. Accordingly, the project was closed in June 2005 after incurring expenditure of ₹ 1.36 crore. The project was able to generate two each of Indian and foreign patents. However, CSIR was unable to attract foreign participation in commercialisation of the project.

Audit observed that Champions Group constituted for the project had only one member who was the project investigator from CLCR (participating institution). No expert from industry was included in the Champions Group. This was not only in violation of NMITLI guidelines but also indicated that assessment of project proposal was inadequate in terms of its commercial viability. Consequently, industry association was explored only after implementation of the project and efforts proved to be neither non-productive, as neither Indian nor foreign industry showed interest in commercial production of developed prototype.

Thus, failure of CSIR to assess commercial viability of the project led to a situation where there were no users of the developed technology, thereby rendering expenditure of ₹ 1.36 crore incurred on the project as unfruitful.

While accepting that no industry was forthcoming for commercial exploitation of the product, CSIR stated (May 2015) that commercialisation of developed products does not fall under CSIR-NMITLI ambit.

The reply is viewed in light of the fact that objective of NMITLI was to develop global leadership, which could not be achieved, as there were no users for the developed technology.

4.1.5 Conclusion

Even after investment of ₹ 630.50 crore under New Millennium Indian Technology Leadership Initiative (NMITLI) scheme in a span of 14 years (2000-01 to 2013-14), Council of Scientific and Industrial Research failed to achieve global leadership in any niche area, as envisaged in the scheme. Out of 30 projects test-checked in audit, envisaged objectives were not achieved in six projects. Although some technologies/processes were developed in 24 projects the same were transferred in only eight projects and further commercialised in only four projects i.e 13 *per cent* of the sample. The reasons for non-commercialisation of technologies were discontinuance of industrial partners, commercial un-viability, change in market conditions and development of incomplete technology.

Audit observed poor monitoring in recovery of soft loans which resulted in accumulation of heavy outstanding dues to the tune of ₹ 64.92 crore. Audit also observed shortfalls in monitoring of projects, non-compliance with guidelines of NMITLI scheme and delays in completing projects. The scheme failed to provide any national and/or international leadership to the Indian industry, as envisaged through development of new technologies under NMITLI that were globally competitive.

4.2 Irregular grant of promotions with retrospective effect

Contrary to Government of India instructions, Council of Scientific and Industrial Research Scientist Recruitment and Assessment Promotion Rules, 2001 contained provisions for retrospective promotions. Resultantly, its four test checked laboratories promoted 256 scientists under Flexible Complementing Scheme with retrospective effect, which resulted in irregular benefits of ₹ 4.81 crore.

Department of Personnel and Training (DoPT) issued (November 1998) instructions on modification of the existing Flexible Complementing Scheme (FCS)⁵⁵ for in-situ promotion of scientists working in various scientific departments of Government of India. These instructions, issued consequent to Fifth Pay Commission recommendations, prescribed minimum residency period and assessment procedure for in-situ promotion of scientists and technical staffs. The FCS was applicable to all Scientific and Technological departments.

Ministry of Science and Technology (MST), while issuing (January 1999) Guidelines for Enhancement of Functional Autonomy of R&D Autonomous Institutions under S&T Department emphasised that exercise of enhanced financial powers would be

⁵⁵ An in-situ promotion scheme for Scientists and Technologists holding Group-A scientific posts in Science and Technology Departments and who are engaged in scientific and technical activities and services

subject to provisions of GFRs and other instructions issued by the Central Government from time to time. DoPT, in response to references seeking clarification on the date from which such promotions were to be given, communicated (July 2002) that in-situ promotions under FCS, in accordance with general principles followed in promotions, should be effective from a prospective date after the competent authority has approved the same. Subsequently, based on recommendations of Sixth Pay Commission, DoPT further modified (September 2010) FCS and introduced revised pay scales and assessment procedures. However, DoPT reiterated (September 2012) its earlier position regarding date of grant of promotion under FCS, clarifying that promotion cannot be made with retrospective effect.

Thus, no promotions could be granted with retrospective effect.

Council of Scientific and Industrial Research (CSIR), an autonomous body of Department of Scientific and Industrial Research and substantially financed from GoI grants, formulated its Assessments and Promotions Rules effective from January 2001 and made provision for promotion of its scientists on the basis of FCS.

Audit observed that Assessments and Promotions Rules of CSIR (clause 7.6.6) provided that scientists recommended as fit for promotion under FCS shall be promoted from the due date of eligibility for assessment. The provision was in contravention of instructions of DoPT, which clearly specified that promotion would be effective from a prospective date after due assessment of the concerned scientist and after the same had been approved by competent authority. This was also in contravention of Rule 209 (6) (iv) (a) of General Financial Rules, which states that all grantee institutions or organisations which receive more than 50 *per cent* of their recurring expenditure in the form of grants-in-aid, should ordinarily formulate terms and conditions of service of their employees which are, by and large, not higher than those applicable to similar categories of employees in Central Government.

Audit test checked cases of in-situ promotions of scientists (Gr A) in four constituent Laboratories of CSIR and found that during the period July 2002 to December 2013, 256 scientists were granted promotions under these rules by ante-dating the effective date of promotion by two months to eight years from the date of issue of promotion orders and paid salaries and arrears accordingly, resulting in irregular grant of benefits to the extent of ₹ 4.81 crore as shown in Table 23.

Table 23: Irregular benefits given to scientists promoted with retrospective effect

Name of the institute	Number of scientists promoted with retrospective effect	Irregular benefits paid (₹ in crore)
Central Mechanical Engineering Research Institute, Durgapur	81	1.70
National Metallurgical Laboratory, Jamshedpur	51	1.24
Central Glass and Ceramic Research Institute, Kolkata	67	1.06
Institute of Minerals and Materials Technology, Bhubaneswar	57	0.81
Total	256	4.81

There is clear possibility of grant of similar promotions in other cadres of these institutes and for all cadres in remaining 34 Laboratories/Institutions of CSIR and CSIR Headquarters.

Central Glass and Ceramic Research Institute, Kolkata (CGCRI) stated (October 2014) that FCS was not applicable to CSIR and the affairs of the Society were regulated in terms of its Memorandum of Association, Rules and Regulations and Bye-Laws. The reply of CGCRI is not acceptable since provision for promotions under FCS was subject to instructions issued by Government of India.

The matter was referred to CSIR and DSIR in February 2015 and May 2015 respectively; their reply was awaited as of June 2015.