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STANDING COMMITTEE ON INFORMATION TECHNOLOGY (2006-2007)

FOURTEENTH LOK SABHA

MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
(DEPARTMENT OF INFORMATION TECHNOLOGY)

FUNCTIONING OF CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING (C-DAC)

FORTY-NINTH REPORT

LOK SABHA SECRETARIAT
NEW DELHI

August, 2007/*Sravana,* 1929 *(Saka)*

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Presented to Speaker, Lok Sabha on 3.8.2007
Presented to Lok Sabha on .....
Laid in Rajya Sabha on .....

LOK SABHA SECRETARIAT
NEW DELHI

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21. Shri Ramesh Dube@

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* Nominated *w.e.f.* 25th September, 2006 in place of Shri Rajnarayana Budholia, MP (L.S.)

** Nominated *w.e.f.* 28th November, 2006.

Nominated *w.e.f.* 23rd February, 2007.

@ Nominated *w.e.f.* 21st June, 2007.

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2. Shri P. Sreedharan — *Joint Secretary*
3. Shri P.C. Koul — *Deputy Secretary*

[#]Vice Shri Vijay J. Darda nominated to Committee on Finance *w.e.f.* 14 December, 2006

INTRODUCTION

I, the Chairman, Standing Committee on Information Technology (2006-07) having been authorised by the Committee to submit the Report on their behalf, present this Forty-Ninth Report on "Functioning of Centre for Development of Advanced Computing (C-DAC)" relating to the Department of Information Technology, Ministry of Communications and Information Technology.

2. The Committee took oral evidence of the representatives of the Department of Information Technology and Centre for Development of Advanced Computing (C-DAC) on 4th July, 2007.

3. The Report was considered and adopted by the Committee at their sitting held on 2nd August, 2007.

4. The Committee wish to express their thanks to the representatives of the Department of Information Technology and Centre for Development of Advanced Computing (C-DAC) for appearing before the Committee and furnishing the information in connection with the examination of the subject.

5. For facility of reference and convenience, the observations and recommendations of the Committee have been printed in bold letters in Part-II of the Report.

NEW DELHI;
2 *August*, 2007
11 *Sravana*, 1929 *(Saka)*

NIKHIL KUMAR,
Chairman,
Standing Committee on
Information Technology.

PART I

REPORT

I. Introductory

Centre for Development of Advanced Computing (C-DAC) is an autonomous scientific body of the Department of Information Technology (DIT). C-DAC is a society registered under the Societies Registration Act, 1860. It has been carrying out Research & Development in Information Technology, Electronics and associated areas for more than one and half decade. The Committee have been informed that starting from its initial mission of building indigenous supercomputers, C-DAC has progressively grown to build an eco-system and institutional framework for innovation, technology development, skills, delivery plans, collaboration, partnership and market orientation in a number of niche areas of national importance and market relevance in Information & Communication Technologies (ICT) and Electronics. It endeavors to identify promising ideas, nurture building of ideas and competencies and convert many of them into practical tools, technologies, products and services to meet the needs of Small and Medium Enterprises and other industrial players in the country and end users in Science and Engineering, manufacturing & service sectors, government, health, development and strategic sectors.

2. The DIT have informed the Committee that the major activities carried out by C-DAC across its various Centres and groups can be broadly classified into following areas:

(i) **High Performance Computing/ Super Computing** (Technology, Hardware, Software Products, System Solutions, Applications, Infrastructure and Facilities, Cyclone Predictions, etc.);

(ii) **Grid Computing** (Disaster Management, Bio-informatics, Climate modelling, Earthquake engineering, Astrophysics, EU-India Grid project to integrate European and India Grids);

(iii) **Language Computing** (Technologies, Standards, Products, Innovations and Market Leadership, Proliferation of Indian Language Computing in all 22 officially recognized languages);

(iv) **Software Technologies** (Competencies, e–governance solutions, tools for ICT for development deployed in many villages, R&D in different segments of Computer Science, Free/Open source software and bundled distribution of Desktop Linux Operating System—Bharat Operating System Solutions (BOSS) , Geomatrics and Audio-Visual Presentations);

(v) **Professional Electronics** (Competencies, Technologies and Leadership at the national level in a number of chosen areas including power electronics, control systems such as Supervisory Control and Data Acquisition (SCADA), Very Large-Scale Integrated (VLSI) & Embedded systems, Real time Systems, Broadband & Wireless, Agri-Electronics);

(vi) **Cyber Security and Cyber Forensics** (Cyber Security Technologies, Tools and Solution development, Competencies and Services of value to both enterprise and strategic/ government users and Research and Training);

(vii) **Health Informatics** (deployment of Health Information System Solutions in hospitals, development and deployment of Tele-medicine products, Ayusoft solutions, Deployment of solutions for Oncology in Kerala and blue-print for deployment plans for nation-wide Oncology network Rural Health Management Information System for Primary Health Care); and

(viii) **Education & Training** (Finishing Schools –Diploma, Formal Higher education, and Short Term Executive Programs) to over 3 Lakh students in contemporary High End Technology areas: Advanced Computing, VLSI, Embedded systems, etc.

3. The Committee have been informed that C-DAC, today has 11 Centres/Labs across the country as follows:

1. Bangalore–Knowledge Park
2. Bangalore–Electronics City
3. Chennai
4. Delhi
5. Hyderabad
6. Kolkata
7. Mohali
8. Mumbai
9. Noida

10. Pune
11. Thiruvananthapuram.

There are about 2200 people working at these locations.

II. Organisational Setup

4. The Committee have been informed that the governance structure of C-DAC consists of the following three bodies.

(i) Governing Council (GC)
(ii) Technical Advisory Committee (TAC)
(iii) Coordination Committee (CC)

The GC, which is the highest decision making body is chaired by the Minister for Communications and Information Technology. The Secretary, DIT is Vice-Chairman of the GC. There are 10 other members consisting of eminent scientists, members of the industry, academia and Government.

The TAC is chaired by Director General, CSIR and has nine other members consisting of eminent scientists and researchers from Government, academia and industry. This Committee provides technological directions and suggests areas of great importance and opportunities in the national and international context.

The CC, which is headed by the Secretary, DIT, acts as a single window, clearing house in respect of interaction between DIT and C-DAC. It deliberates on policy matters as well as operational and financial issues on behalf of the GC and DIT for quicker action.

(i) Meetings of Governing Council/Committees of C-DAC

5. The Committee desired to know about the number of meetings of GC, TAC and CC in last five years. The Department submitted the following information in this regard:

Sl. No.	Council/Committee	No. of Meetings held in last five years (as on 15 July, 2007)
1.	Governing Council	04
2.	Technical Advisory Committee *(Set up in January, 2004)*	02
3.	Coordination Committee *(Set up in January, 2004)*	06

6. The Committee have been further informed that on December 16, 2002, three organisations *viz*. Electronics Research & Development Centre of India (ER &DCI), National Centre for Software Technologies (NCST) and Mohali Centre of the Centre for Electronics Design & Technology of India (CEDTI) were merged with C-DAC.

7. When asked as to what were the reasons that prompted the merger of these organisations, the Department informed that the merger was based on the recommendations of the Expenditure Reforms Commission as contained in their third Report which exclusively deals with autonomous institutions under Government of India. It was considered necessary to re-structure the societies for achieving the broad objectives of employment generation, creation of wealth and IT led economic growth. Interest of national security, societal equivalence, implication of research in the field of Information Technology on socio-economic outcomes. Considerations of harnessing economies of scale in the operation of the societies have also been borne in mind.

8. The organizational set ups of C-DAC headquarters and Centres are given at Appendices I & II respectively.

(ii) Strengthening Corporate Office of C-DAC

9. In reply to question as to whether any change was required in the Organisational set ups of Centres/Labs, the Department have stated that given the nature and spread of the organization, C-DAC Headquarters (Corporate Office) needs to be strengthened with suitable staffing at various levels (as is the situation in other such organizations). This will help it to undertake effectively mission mode programs leveraging the resources of groups/centres across the country. Besides, setting up of a commercial arm (as proposed) for tie-up between R&D and commercialization will help greater effectiveness in lab-to-market efforts.

10. When asked about the present status of the proposal to strengthen its Corporate Office, the Department have stated that a proposal for manpower requirement for Corporate Office was first presented by C-DAC to the Coordination Committee in its 3rd meeting held on 23rd June 2005. The proposal included various positions, pay scales and number of posts for the Corporate Office. In March 2006, C-DAC was informed that the matter required to be referred to the Ministry of Finance.

III. Funding of C-DAC

11. C-DAC receives funds from DIT, Government of India in the form of Grant-In-Aid to carry out its R & D Activities. It is supplemented by the funds from sponsored research programmes and reserves generated from Internal Revenues.

12. The Allocations sought by C-DAC, the Budget Estimates (BE), Revised Estimates (RE) and Actual Expenditure relating to C-DAC for the last three financial years and 2007-08 are as follows:-

(Rs. in Crore)

Years	Budget Proposed	Budget Estimates (BE)			Revised Estimates (RE)			Actual Expenditure		
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
2004-05	46	40	3	43	40	3	43	40	3	43
2005-06	87	60	3	63	60	3	63	60	3	63
2006-07	90	64.5	3	67.5	64.5	3	67.5	64.5	3	67.5
2007-08	127	75	3	78	—	—	—	—	—	

13. In reply to a query whether the funds allocated by the Government for the current financial year would be sufficient to carry out the research activities of the Centre or C-DAC anticipates requirements of additional funds, it has been stated that given the projections, funds allocations have been less. Some areas as a result tend to get slowed down. Alongwith other supportive measures in respect of measures for attraction and retention of talented manpower and better infrastructure (as indicated earlier), higher quantum of funding will help C-DAC to set the bar high in fulfilling its mandate and realize its full potential and meet the needs of the situation.

14. Replying to a specific query regarding the areas which may suffer due to reduced allocations, C-DAC stated that in view of the reduced allocation, Grid Computing, shared e-Science resources/ facilities will suffer to some extent and pace of other core R&D programmes will get reduced accordingly. R&D efforts would be affected accordingly.

15. Further, when asked about the help needed from Government to upgrade its research activities, C-DAC replied that in many high technology and high obsolescence areas such as Supercomputing, timely and critical quantum of investments (financial and infrastructural) is

necessary. The investment as such needs to be upgraded—commensurate with technological progress and demand side of the market.

IV. Manpower Attrition

16. C-DAC in reply to a query regarding specific constraints/problems being faced in its activities, have replied that today, the foremost constraint of C-DAC is its inability to attract and retain talent in the current market conditions. Even while this is receiving the attention of the Governing Council and the Government, higher level attention and support is absolutely necessary for important institutions such as C-DAC to sustain their momentum. Performance linked incentive and reward would be helpful in line with the prevailing trends in the market.

17. In fact, during the course of the oral evidence of the representatives of DIT and C-DAC before the Committee, DG, C-DAC admitted the following in the context of slippages in set targets,

"We lacked crucial manpower and we lacked infrastructure".

The Secretary, DIT also averred with the views of DG, C-DAC and said:

"Sir, there is one thing which is general problem not only regarding DIT and its organisations, but also other scientific communities. There is a lack of emoluments as compared to what is happening in the private sector".

18. Further, in reply to a query regarding attrition of manpower, C-DAC has stated that over the years, C-DAC has been facing problems of attrition like other organizations, especially because of boom in IT industry and demand for skilled manpower.

19. Manpower attrition rate during the year 2004 to 2006 at various centres of C-DAC is given below:

C-DAC Centres	2004	2005	2006
1	2	3	4
Pune (including Knowledge Park - Bangalore, Hyderabad, Chennai and Delhi)	37.70%	7.10%	16%

1	2	3	4
Mumbai (including Electronics City, Bangalore)	22%	18%	20%
Mohali	15%	15%	24%
Noida	22%	22%	38%
Kolkata	12.07%	12.07%	10%
Thiruvannathapuram	5%	5%	5%

20. Classifying attrition levels across the hierarchy, C-DAC informed that the attrition is higher amongst the scientific and technical categories of employees. The attrition is highest at the entry-level followed by the next two higher levels. There are many instances of crucial loss of manpower at middle level or senior middle level, as well, leading to enormous loss of expertise.

21. When asked about the reasons behind this serious problem and whether the matter was taken to higher levels, C-DAC replied that the differential in the salary compensation between C-DAC and the industry is one of the main factors behind this problem. C-DAC is in discussion with DIT in this regard. The matter will be taken up with the Governing Council.

22. With reference to the measures taken to tackle the problem of attrition, it has been submitted that C-DAC has been making efforts to address this issue by a number of measures including choice of challenging R&D topics, appraisal process which gives constant feedback, employee satisfaction survey and refresher training programmes focused towards employee development. All these have resulted in progressive reduction in attrition. Recruitment and training of new talent has been taken up. Efforts are also being made to take lateral induction of project leaders to higher levels. The Governing Council of C-DAC has also been seized of the issue of improving various amenities provided to C-DAC members and other ways of improving the compensation along with better performance.

23. Further, when enquired about any proposal ever made for performance linked incentives and rewards to its employees, C-DAC stated that such a proposal was made. However, this was not considered favourably by DIT in view of the Ministry of Finance guidelines. This issue will be taken up with the Governing Council.

V. Setting up of Commercial arm of C-DAC

24. About the specific help that C-DAC requires from the Government to upgrade their research and promotional activities it has been stated that a linkage to address commercialization of C-DAC technology has become the prime need of the day. Homework to establish a commercial arm has already been made, accordingly this issue needs to be addressed.

25. In reply to a query regarding contours & shape of proposed commercial arm, the present status of the proposal and how commercial aspects were dealt in past C-DAC has replied that it has prepared a proposal for setting up an adjunct corporate entity, hiring the services of a reputed technology consultancy agency. It addresses the felt need for a commercial arm of C-DAC and provides linkage between R&D and commercialization for enhancing lab-to-market effort. Senior Executives of C-DAC and the consulting agency interacted vigorously to come out with a proposal titled 'Enterprise Transition of C-DAC'. The core concept and ideas of this proposal were presented to DIT in April 2007. As of now, various groups and centres use their own mechanisms to do commercialization of their R&D output.

VI. High Performance Computing

26. The Committee have been informed that one of the major functions of C-DAC is development of High Performance Computing (HPC). Providing details about HPC and role played by C-DAC in its development, the Department in a background note on the subject have stated that C-DAC, having been set up as India's National Initiative for the development of indigenous supercomputing technology, has played a pioneering role in the development and deployment of the PARAM series of supercomputers. PARAM Padma with a peak performance of one teraflop (TF) is the latest in this series and is housed at C-DAC's Tera Scale Supercomputing Facility (CTSF) at Knowledge Park, Bangalore. In furtherance of its activities in development of technologies and solutions for High Performance Computing, C-DAC has identified Grid Computing as a major thrust area.

(i) Next Generation PARAM Super Computer

27. According to the Outcome Budget (2007-08) of the Department, the timeline for commissioning 5 Teraflops peak (TFs) systems was December, 2005. However, this project was delayed and subsequently targets have been revised to 10 Teraflops sustained (TFs) systems.

28. During evidence on 4 July, 2007, DG, C-DAC when asked about reasons for delay in commissioning of next generation system, stated:

> "……In HPC, in terms of development we did lag behind. We had manpower problems. I would think, we did about 70 per cent."

> "…. Six months to one year earlier, we should have delivered."

29. About the reasons necessitating this revision, DG, C-DAC informed the Committee during oral evidence:

> "we have talked about originally 5 Teraflops (TFs) and we missed the target. What we have done was that because the technology meanwhile is changing, we have revised the target to an upgraded machine of 10 teraflops and that too instead of a peak, we are now providing what we call sustained 10 teraflops. So, though we might have missed, we are now promising to make up……"

30. Supplementing him, Secretary, DIT stated:

> "And there was a change in the advancement in technology and, therefore, there was a need to revise the architecture and the proposal itself."

31. Clarifying further about the reasons for delay a representative of C-DAC stated:-

> "…….We are using the microprocessor for building the machine. We do not design these microprocessors. We have to buy from companies like Intel, IBM, etc.. Now, we had to depend on them to deliver the computer nodes which are the heart of supercomputer. Now, there is a slippage on their part. This is one of the important reasons."

32. During evidence on 4 July, 2007, the DG, C-DAC in reference to the commissioning of 10 TFs system, stated:

> "we are delivering it by the end of the third quarter, that is, by October-December (2007) period".

33. However, the Department in written replies dated 15 July, 2007 have stated in regard to the timeframe of launching next generation PARAM with sustained computing power of 10 Teraflops (TFs) that the next generation PARAM system with a sustained computing power

of 10 Teraflops (TFs) is scheduled for commissioning during December 2007-February, 2008.

34. The Outcome Budget of the Department for 2007-08 also indicated that the 10 Gbps interconnect which ought to have been in place by December, 2006, however, has also missed the deadline.

(ii) Requirement of Supercomputing Resources

35. During examination of Demands For Grants (2006-07) of the Department, the Committee came across a serious short supply of supercomputing resources for problem solving even as India is coming of age in its aspirations in terms of research, engineering and grand challenge problems. They were also informed that India should aim to have more supercomputer resources and build capacity in the form of shared facilities, building of user competence of learn to benefit from Supercomputers, etc.

36. In this context mentioning the steps proposed to be taken to meet supercomputing resource requirement, the Department stated that the requirement for Supercomputing resources can be met as follows:

- Building and operating large supercomputing facilities at select locations and providing access through high-speed Networks and Internet;
- Grid enabling HPC infrastructure and continuous development of high-end HPC systems; and
- Proliferating smaller/medium range systems at multiple user sites for learning and prototype application development.

37. Regarding the constraints/difficulties being faced by C-DAC in this reference, the Department in the same reply have stated the following:

- Ability to retain and attract skilled professionals to operate such facilities on a long term basis;
- Availability of necessary funds to set up such systems; and
- Lack of necessary infrastructure & funding for the same.

38. Further, in reply to a question as to whether these constraints have been brought to the notice of the Government and what corrective measures have been suggested in this regard, C-DAC submitted that the constraints regarding inability to retain and attract skilled

professionals to operate supercomputing facilities on a long term basis, non-availability of necessary funds to set up such systems, and lack of necessary infrastructure & funding for the same have been taken up in the Governing Council, Coordination Committee and other instruments of C-DAC/DIT……. The resource requirements have been projected in the 11th Plan and Annual Plan documents. For the year 2007-2008, as against the projected requirement of Rs. 127 crore the actual allocation is Rs. 75 Crore. However, the core funding through Plan allocation is increasing year by year for the last few years…….. As regards infrastructure, in-principle approval was given earlier. Individual proposals for infrastructures including land and building are being proposed for consideration and approval……. As regards attraction and retention of skilled professionals, the issue is taken up from time to time. From within the organization, regular training for skills development, motivation through work on nationally important projects, conducive eco-system development are undertaken.

39. When asked about the percentage utilization of PARAM series computers and steps being taken to increase its user base, C-DAC in a written reply stated that utilization of PARAM Padma hosted at CTSF - C-DAC's Terascale Supercomputing Facility—is approximately 70%. This is rated to be fairly high with reference to the utilization of supercomputer facilities across the world. System Availability is more than 99%. Storage usage is more than 3.5 TBytes……The PARAM Padma supercomputer at CTSF has been put to major use by users from C-DAC and over 80 technical affiliates registered for this facility from premier research and educational institutes across India. They can access this facility either through internet or through high-speed communication network of GARUDA grid……Some portions of the PARAM Padma (64 CPU) are reserved for GARUDA grid users community.

40. It was also stated that in addition to above the following steps for increasing the utilization further were being taken:-

- Putting the Systems on Grid.
- Conducting regular training and workshops for potential users.
- Deployment of various configurations of these systems at premier academic and research institutes.

VII. Grid Computing

41. Highlighting the objectives of Grid Computing and activities of C-DAC in this area, the Department in a background note on the subject have stated that recognizing the importance of Grid computing, DIT have funded C-DAC to execute national grid GARUDA. In this area, C-DACs ongoing work cover design, and deployment of a distributed computing capability, initially across 45 institutions in 17 cities across the country over an ultra-high capacity network in its Proof of Concept (PoC) phase. The capability will subsequently lead to facilities based on terascale clusters, a few hundred terabytes of storage archives, a 10 Gbps network and data management software and Grid computing technologies. The connectivity will enable sharing of data, algorithms and research outputs in real time. The focus will be on developing application software through the establishment of a Grid Strategic User Group that will drive the usage of the Grid by multiple users across the country.

42. The Objectives of Grid computing are:

- Sharing of high-end computational resources with the larger scientific and engineering community across the country;
- Addressing the requirements of emerging High Performance Computing applications by integrating geographically distributed resources;
- Providing Universal access to resources; and
- Creating a Collaborative Framework for solving applications, which are interdisciplinary requiring experts from multiple domains and distributed locations.

43. According to the written notes furnished by the Department, the project was initiated in October, 2004. Original time frame for completion of the Proof of Concept (PoC) phase of Grid Computing was one year. Now, extension of the operational phase till March, 2008 is being requested.

44. When the Committee, during evidence on 4 July, 2007 enquired about the reasons for request for extension DG, C-DAC, stated:-

> "In this case, the inherent nature of the project is that 38 institutions are involved in this. To energize them, to bring them into the concept and technology, to give them on course, make them contribute their own resources and complete other administrative

processes and so many things are there. It is like a community building which sometimes takes more time. Community building unfortunately took a longer time."

VIII. Cyber Security

45. Giving details about the progress made by C-DAC in the field of cyber security, the Department in the material submitted to the Committee have stated that C-DAC with wide experience in R&D has chosen cyber security as one of the priority area proposing to deliver multilevel/multilayered security solutions to safeguard the Government Infrastructure. Solutions already developed in this direction are Cyber Forensics tools, Adaptive Intrusion Detection System, End systems security solution, document security solutions, Steganographic tools, etc. These solutions cannot be static as the attacks keep growing with changing times and technologies. It has been further stated that C-DAC continues to explore delivering the need of the hour Cyber Security Solutions as follows:

- Cryptography/Cryptanalysis;
- Cyber Forensics;
- Face Recognition and associated biometrics techniques;
- Legal Interception of Voice over Internet Protocol(VOIP) packets transparent, end-to-end security-hardened solutions;
- Intrusion detection systems;
- Secure Storage System;
- Digital Audio Watermarking; and
- Trust Enhancement of Cyber Space for promotion of e-Governance.

46. In reply to a query regarding level of success of these solutions in ensuring cyber security, C-DAC stated that indigenous Cyber Forensics tool kit and Cyber Check Suite developed by C-DAC have been utilized by several leading Law Enforcement and Forensic Agencies in the country such as CBI, IB, CFSL and State Police, etc.. Over 60 licences of Cyber Check Suite have been delivered to these agencies as well as Defence organisations. These tools have helped in investigating cyber crimes, conforming to IT Act Provisions. Steganalysis Tools have also been developed and integrated with the Cyber Forensic Tools. Adaptive Intrusion Detection System developed by C-DAC has been tested by a number of agencies and they are also seriously considering its deployment.

47. Regarding problematic areas where these solutions were found inadequate in tackling cyber crimes, C-DAC have stated that the solutions provided by C-DAC with respect to Cyber Forensics are effective in carrying out offline analysis of cyber crimes. However, they cannot be used to tackle on-line cyber crimes, which are increasing rapidly day by day. With further development support, the tools could be scaled up and made effective for on-line monitoring and analysis. Being essentially of catch-up nature, newer violation methods are likely to be improvised; and that will demand perpetual vigilance and design of new solutions.

48. During oral evidence on 4 July, 2007, when the Committee enquired about the level of progress made in providing cyber security solutions and whether they are of International standards, the representative of C-DAC responded:-

"…….. so far, I can say no. We still lack that level."

IX. Multilingual Computing

49. Explaining the importance of Multilingual Computing and work done by C-DAC in this field, the Department have informed the Committee in a background note on the subject that Computer technology in India has both a developmental as well as a social role. In its developmental role, it is concerned with the design and development of newer technologies for various applications. In its social role, it breaks the language barrier and bridges the gap between the various sections of the society through easier access to information using their respective mother tongues or local languages. Language here has a major role to play and, therefore, language computing becomes central to the exchange of information across speakers of various languages. Language computing, therefore, faces two major challenges - first, the development of appropriate language tools and technologies for its total language computing needs and secondly the multiplicity of Indian languages with different scripts, dictions and styles, each vying for a place in the computing roadmap. The ultimate goal of multilingual computing is to ensure that the technology reaches the common man at his doorstep in his own native tongue so that he feels more at home working with the new technology. This in turn will facilitate his active involvement in the whole process of social and economic advancement that the new technology is expected to bring about. In Multilingual Computing and Allied Areas, C-DAC continues to work towards the design, development and deployment of technologies/solutions for the following:

- Machine Assisted Translation (MAT) systems;
- Automatic Speech Recognition (ASR) systems;

- Text-to-Speech (TTS) systems;
- Optical Character Recognition (OCR) systems;
- Fonts (TTF & OTF) for Indian Languages; and
- Other Multilingual tools such as data processing tools, information extraction and retrieval tools, dictionaries, spell-checkers and grammar-checkers, etc.

50. Some of its notable achievements in these endeavours include Text-to-Speech (TTS) in Bangla which was used by the State Election Commission to announce West Bengal State Election Results in 2006. TTS for Nepali is also under development. In the Automatic Speech Recognition Project, development of the 'Shrutlekhan-Rajbhasha' with the support of Official Language, Ministry of Home Affairs had already been done. This can be made available to masses in CD form.

(i) Lack of standardisation and lexical resources

51. In reply to a query regarding constraints being faced by C-DAC in the field of multilingual computing, the Department in their reply have *inter-alia* stated that the constraints faced are as under:

(i) Lack of adherence and proliferation of standards such as storage, display, inputting, dictionary formats, etc (for all 22 scheduled languages). States need to take lead.

(ii) Non-availability of lexical resources which are essential for development of spellcheckers, grammar checkers, dictionaries, thesaurus, and most of the Natual Language Processing (NLP) related Research and tools".

52. From the information made available to the Committee C-DAC claimed to have pioneered the language technology and through its continuous R&D activities played a vital role in standardization, proliferation and developments of tools and technologies for common man. Currently an estimated 15-20 million users are using C-DAC's GIST- Graphics and Intelligence based Script Technology over the last 15-16 years. The same is being promoted by NIC and other Government Organisations. Some of the states like Maharashtra, Gujarat and Andhra Pradesh have standardised on C-DAC's multilingual products/tools. Given the immense utility of multilingual computing the Committee desired to know the reasons as to why other states are not keen to get standardized on C-DAC's multilingual products/tools. The Department in a written reply have stated that as indicated above, a few states have standardized on some of the C-DAC's multilingual products for

use in various Government departments. The requirement from the State Government is a mix of products and tools for enabling/ developing multilingual applications. Other states such as Orissa and Kerala are also using C-DAC's GIST technology for varied applications, directly as well as through NIC and other organizations. With MNC companies also providing support to a few Indian languages, states have an alternative option to use.

53. Describing the initiatives taken by C-DAC for promoting standardization, the Department in the same reply have stated that C-DAC participated in proliferation of National Standards for Storage (ISCII – Indian Standards Code for Information Interchange) and Input (INSCRIPT keyboard) Standard. However, with the changing technology and support of all Universal languages, International standards such as Unicode are formed & are being developed/supported/implemented by various MNC's. One of the major agenda of C-DAC is to provide inputs or evolve standards for at least all the 22 scheduled languages. Recently C-DAC has worked on standards for Bodo, Santhali, Maithili, Dogri, and Vedic Sanskrit and others with participation from various institutions, and experts from various states. C-DAC is actively participating in various standardization meetings organized by DIT as well as state Governments.

54. When asked, whether C-DAC has any plan to overcome these constraints, the Department in their reply have stated that following was being done:

- Standardization meetings with participation from states and stake holders, and
- Establishing linguistic resource development centres with regional participation and adopting best practices in this field and studying work carried out outside the country.

55. It was further added that active participation from various States is crucial for development, implementation of standardized solutions. Participation of State level representative/ authority in standardization meetings held at National level.

(ii) Non-availability of skilled manpower in computational linguistics

56. Listing the constraints being faced by C-DAC in Multilingual Computing, the Department in a written reply have stated the following:

- "Non-availability of skilled manpower in the area of computational linguistics. Since working in language

technology area requires computational as well as linguistic skills it is difficult to get the relevant manpower. Also general trend is that freshers are not keen in working on domain specific language technology; they prefer working in broad IT areas which gives them better and wider placement opportunities.

- Manpower attrition.
- Skilled Language computing and Language experts are not readily available to be deployed on these projects. Attracting members to work in the area of language technology is difficult. The new generation is not very keen on working in NLP areas, since majority tends to work in computation part; Attracting manpower to work in the field of Language technology; and retaining and motivating best of talents also is an issue."

57. Suggesting steps to overcome these constraints, the Department in a written reply, have mentioned about starting computational linguistics programmes in Universities as well as C-DAC Centres (with more focus on practical aspect); giving due importance to language technology in schools, colleges and universities; course curriculum by default having language technology subject; starting of Computation linguistic courses; giving better incentive to members working as well as to the Industry for marketing/developing language enabled product, eg: giving more tax benefits so that industry/developer tends to develop software in Indian languages by default. Indian language software's, hardware, etc may be provided separate and better taxation as compared to English alone tools/technologies.

X. Education & Training

58. As per some reports if the Indian IT Industry has to achieve a target of US 60 billion in exports by 2009-10, it would require an estimated 8,50,000 IT professionals and 1.4 million ITES-BPO professionals by 2010. With offshore penetration for both IT as well ITES-BPO services estimated at about 10 percent, and off shore adoption rising rapidly, demand for these services from India is expected to continue on its high growth trajectory. Besides, the Indian IT Industry is growing at a faster pace and more and more companies are setting up their businesses in India. The developing business demands an appropriate sized and skilled workforce. However, in the current scenario, many graduates coming out of academic institutions are unable to meet the IT industry's requirements.

59. When enquired about the role of C-DAC in meeting the requirement of IT industries for skilled workforce, the Department in a written reply have stated that C-DAC offers various high-end courses in Advanced Computing, Embedded systems, VLSI design, Bioinformatics, Geomatics, etc. for experienced as well as fresh graduates. C-DAC's IT courses are meant to bridge the gap between academic institutions and industry.

60. It was further stated that C-DAC's training and education activity in Advanced Computing is creating high quality manpower for ICT industry. The Centre designs and delivers various specialized training programmes in ICT. Its Education and Training Programmes continue to build and enhance skills in critical areas of Information Technology and electronic product development throughout India. C-DAC is recognized by major corporates in India to be a preferred high-end provider of skilled manpower in areas of ICT. With the help of about 50 training centres, C-DAC is playing an important role in making available skilled workforce. Apart from ICT industry requirements, C-DAC also plays an important role in imparting IT training programmes to the Government employees. C-DAC has trained more than 60000 employees of Government of Maharashtra and imparted basic IT literacy programme. C-DAC is contributing in supporting the drive of Indian defence forces for IT enabled workforce by offering various specialized IT training programmes to the personnel of Indian Army and Indian Navy across India. About 10000 army personnel get trained every year. Mainframe training, DESD course and other specialized courses like .NET, etc. contribute a lot in producing skilled manpower. M. Tech course focusing on expertise in VLSI is again generating industry-ready manpower.

61. Highlighting further the efforts made by C-DAC to meet the emerging need for IT skilled professionals, the Department have stated that C-DAC along with its network of training centres is making modest contribution in catering to the need of IT industry for skilled manpower; however, looking at the growing demand from the industry, C-DAC is open to expand its training network and make available more number of skilled resources to the IT industry. C-DAC needs to increase the numbers by identifying credible organizations to offer the courses as authorized training centres of C-DAC.

62. It was, however, stated that the requirement of the industry is large and C-DAC is meeting only a small percentage of this requirement. Large scale-up of C-DAC activities may not be viable with the existing infrastructure. C-DAC are looking into the mode of

e-learning solutions in this area so that the fresh engineers can participate in this programme using the virtual classroom concept.

63. Further, in reply to a query as to whether C–DAC has taken up the matter with DIT, C-DAC have stated that e-Learning Division of DIT and C-DAC worked on the concept paper to bring-out the issues to be focused to make e-Learning a more viable mechanism to impart education. C-DAC has been working on e-Learning technologies including tools in its centers at Hyderabad, Mumbai, Pune and Noida. DIT had released Rs.43 lakh during 2005-06 and Rs. 45 lakh during 2006-07 for E-Learning related activities.

64. Underlining the strategy to meet the IT Industry's requirement, C-DAC has also mentioned in a written reply that it plans to scale-up the present course to increase the number of students using authorized training centers and establishment of e-learning servers.

XI. Health Informatics

65. The Department have submitted before the Committee that C-DAC have been working in the area of health informatics for the last several years. The efforts have resulted in deployable systems and solutions for Hospital Information System, Telemedicine, Tele-education and computerized systems for health directorates. C-DAC plans to continue putting effort in this area with focus on the following:

i. Hospital Information System (HIS),

ii. Systems and Solutions for Telemedicine and Tele-education,

iii. Picture Archival and Communication System (PACS),

iv. Medical Knowledge and Decision Support System, and

v. Framework for Standards Compliant Medical Systems.

66. Further, the Department in their Annual Report (2005-06) have stated about a project regarding cancer care for rural masses named 'ONCONET'. ONCONET is a comprehensive telemedicine solution for Cancer Treatment and Follow-up at the Regional Cancer Centre(RCC), Thiruvananthapuram and its Peripheral Centres. ONCONET attempts to arrange a virtual super-specialty environment spear-headed by Regional Cancer Centre, Thiruvananthapuram for its early cancer detection and cancer eradication programmes, exploiting the advanced technologies and latest trends in the industry. It includes a 'Remote Expert Consultation System' with a powerful Video Conferencing System, which provides uninterrupted and qualitative online interaction

between oncologists at RCC and doctors/patients at the five nodal centres. The Learning Resource Centre for Oncology provides cancer related information to clinicians, researchers, health planners, health workers, administrators and patients services of ONCONET. C-DAC has successfully completed the implementation of ONCONET Project.

67. In a presentation made before the Committee on 4 July, 2007, C-DAC has mentioned the following:

- Success of ONCONET in Kerala has led to Cancer Net Project of Tamilnadu which is nearing completion; System Commissioned at Adyar Cancer Centre and at Ghandigram Near Madurai.
- Ayusoft: A WEB-BASED DECISION SUPPORT SYSTEM for Medical Practitioners and Researchers on Ayurved. (domestic and overseas).
- Rural Health Management Information System for Primary Health Care.

PART II

RECOMMENDATIONS/OBSERVATIONS

I. Introductory

1. The Centre for Development of Advanced Computing (C-DAC) is an autonomous body of the Department of Information Technology (DIT) registered under Societies Registration Act, 1860. C-DAC has been carrying out research and development in Information Technology, electronics and associated areas for more than one and a half decade. The Committee find that the endeavours of C-DAC can be broadly classified into high performance computing, grid computing, multi-lingual computing, software technologies and professional electronics, cyber security and cyber forensics, health informatics and education and training. The Institution is today operating from 11 centres and laboratories across the country with an organizational strength of about 2200 personnel. The Committee's observations arising out of examination of C-DAC are dealt with in the succeeding paragraphs.

2. The Committee are happy to note that starting from its initial mission of building indigenous supercomputers, this premier national institution has progressively grown to build an eco-system and institutional framework for innovation, technology development skills, delivery plans, collaboration, partnership and market orientation in a number of niche areas of national importance and market relevance in Information & Communication Technologies and Electronics. That C-DAC has produced several practical tools, technologies, products and services to meet the needs of small and medium enterprises and other industrial players in the country and end users in science and technology, manufacturing and service sectors, Government, health, development and strategic sectors etc. is indeed satisfying.

II. Organisational Set Up

(i) Meetings of Governing Council/Committees of C-DAC

3. The Committee note that the Governing Council (GC), the Technical Advisory Committee (TAC) and the Coordination Committee (CC) headed by the Minister of Communications and

Information Technology, Director General, CSIR and Secretary DIT respectively, form the core of governing structure of C-DAC. The Governing Council is responsible for taking major decisions and overall supervision of C-DAC while Technical Advisory Committee provides technological directions and suggestions to them. The Coordination Committee deliberates on policy matters and operational and financial issues on behalf of the Governing Council and the Department of Information Technology. Undoubtedly, these bodies have a major role in guiding C-DAC. They are also the much needed interface between this autonomous Society and various arms of Government and other bodies. Furthermore, they are also the bodies mandated with solving the problems faced by C-DAC and also facilitating their efforts in frontier sciences. The Committee, however, note that the Governing Council met only four times in the last five years while the Technical Advisory Committee and the Coordination Committee met two and six times respectively since their constitution in January, 2004. The Committee feel that this is more than casual approach of the Department towards this premier research and development institute of the country. They are unable to comprehend as to how C-DAC would be able to meet earmarked targets and achieve excellence in its mandated areas in absence of proper guidance, direction, supervision and facilitation. This laxity and lack of interest is all the more unacceptable since the endeavours of C-DAC are in frontier IT technologies where time is of utmost essence. The Committee, therefore, impress upon the Department that there should be frequent meetings of these bodies at regular intervals so as to ensure that decisions on major issues are not delayed and the problems/difficulties being faced by C-DAC are not allowed to linger on to the detriment of national interest.

(ii) Strengthening Corporate Office of C-DAC

4. During the examination of the subject, C-DAC pleaded before the Committee that its headquarters (Corporate Office) need to be strengthened with suitable staffing at various levels. According to C-DAC, this will help the body to effectively undertake mission mode programmes leveraging the resources of groups/Centres across the country. The Committee find force in the demand raised by the Organisation. The Committee find it relevant to point out here that after the merger of three organisations, viz., Electronics Research & Development Centre of India (ER&DCI), National Centre for Software Technologies (NCST) and Mohali Centre of the Centre for Electronics Design & Technology of India (CEDTI), C-DAC is undergoing a consolidation phase, as the merger has increased the number of units

under C-DAC and their presence across country. These factors also necessitate a strong Corporate Office for effective supervision of the units as well as co-ordination among them. The Committee have been informed that C-DAC has submitted a proposal for manpower requirement for the Corporate Office to the Coordination Committee, which is headed by the Secretary, DIT, way back on 23 June, 2005. After about nine months, C-DAC have been informed that the matter required to be referred to the Ministry of Finance. Since no further inputs in the matter have been provided by the Department in the written information submitted to the Committee or during their oral evidence, it can very well be assumed by the Committee that nothing tangible has been done in this regard during the last 16 months. The Committee are constrained to point out that a premier scientific body like C-DAC certainly deserved a better handling. The Committee, therefore, recommend that the Department should now atleast take up the matter with the Ministry of Finance without any further delay. Meanwhile C-DAC should also take interim measures to strengthen its Corporate Office by way of suitable redeployment so that effective functioning of the Organisation is not hampered. The Committee would like to be informed about the progress made in this matter.

III. Funding of C-DAC

5. The Committee note with concern that the Government have not been considering the financial requirements of C-DAC with due seriousness. Against sums of Rs. 46 crore, Rs. 87 crore, Rs. 90 crore and Rs. 127 crore sought by C-DAC during the years 2004-05 to 2007-08 respectively, only Rs. 43 crore, Rs. 60 crore, Rs. 67.5 crore and Rs. 78 crore respectively have been allocated to them. C-DAC has submitted that reduced allocation of funds *vis-à-vis* projections have resulted in slow down of progress/achievements in some areas like Grid Computing, shared e-science resources/facilities and pace of other core R&D programmes. Further, it has been stated that in many high technology and high obsolescence areas, timely and critical quantum of investments is necessary. The Committee are full in agreement with C-DAC and express their unhappiness over the way DIT has been deciding upon the funds requirements of C-DAC. The Committee would like to make it clear to the Department that in frontier areas of supercomputing and related matters the R&D scenarios are changing rapidly. Hence, delay in provision of funds and infrastructure have the portents of causing irreparable losses. The Committee, therefore, expect that DIT will consider the pending and future proposals of C-DAC for release of funds with due promptitude and diligence.

IV. Manpower Attrition

6. During the course of the examination of C-DAC the Committee also found that one of the major reasons behind the slippages in the performance is the inability of C-DAC to attract and retain talent in current market conditions. During the years 2004-06, the attrition rates varied between 5 to 38% at various centres of C-DAC. The attrition rates in scientific and technical categories of employees was stated to be very high. The differential salary compensation between C-DAC and the Industry is the main factor behind this problem. A proposal from C-DAC regarding performance linked incentive and rewards did not find favour with DIT in view of the Ministry of Finance guidelines. The Committee cannot but express their grave concern over this issue.

7. From the materials submitted by the Department the Committee have observed several instances where projects and research activities of C-DAC suffered due to the large scale attrition of skilled manpower from its various centres/laboratories. The rapid growth *per-se* in the IT Sector and the resultant demand of skilled manpower which has created a situation of huge shortage of manpower in IT sector has further aggravated the situation. Therefore, in such a background, there is an inherent need to somehow incentivise employees to avoid attrition and resultant work delays. The Committee are of the opinion that once the commercial arm of C-DAC is in place, C-DAC with approval of concerned authorities may consider sharing certain percentage of revenue generated by the commercial arm as incentive among its technical staff. In the interest of functioning of C-DAC and with a view to retaining the best scientific talent, the Department should also take up the matter with Ministry of Finance for special salary compensation/allowance, scheme/package for personnel deployed in such high end technology areas. At the same time C-DAC should also take steps like creating a conducive and strongly motivational work environment , providing challenging assignments, providing some kind of patent sharing arrangement with adequate bonds/conditions and restructuring of their human resource policy to attract and retain talent. The Committee would like to be informed about the decisions taken in this regard at the earliest.

V. Setting up of Commercial arm of C-DAC

8. The Committee have been informed that C-DAC is working on a proposal for setting up of a commercial arm for quite some time now. According to C-DAC it will be helpful in effective tie up

between R&D and commercialisation and enhance lab to market efforts. For this purpose, it hired the services of a reputed technology consultancy agency and subsequently presented the core concept and ideas of this proposal to DIT in April, 2007. Further, the Committee are informed that contours and shapes of the proposed commercial arm are still being worked out. The Committee exhort DIT to take a decision on the proposal of C-DAC without an further delay. The Committee feel that in view of the desirability of this lab to market interface and as an interim measure C-DAC ought to utilize some Government organizations who are already rendering commendable services in marketing research outputs.

9. One such organization that comes into the mind of the Committee in this context is the National Research Development Corporation (NRDC), an organization under the Department of Scientific & Industrial Research, Ministry of Science and Technology. NRDC is stated to be wholly dedicated to transfer of technologies from R&D laboratories to industry covering the entire spectrum of industrial technologies. NRDC is also stated to be engaged in the development, promotion and commercialization of the R&D results/ technologies emanating from Research Institutes/Universities/ Industries, etc. Similarly, the Antrix Corporation Limited, the commercial arm of Department of Space is also stated to be working successfully for the promotion and commercial exploration of products and services from Indian Space Programme since 1992. The Committee are of the opinion that, pending the formation of its own commercial arm, C-DAC should explore tying-up with such/ similar organisations for commercialisation of their technologies.

VI. High Performance Computing (HPC)

(i) Next Generation PARAM Super Computer

10. The core competency of C-DAC is stated to have been developed in High Performance Computing (HPC) which is very much evident from the kind of progress/achievements shown by C-DAC in developing advanced computing infrastructure in the country over the years. The Committee observe that in pursuance of its objective of developing high end computing resources, C-DAC was assigned the project of commissioning 5 Teraflops (TFs) systems by December, 2005. However, this project was delayed and subsequently targets were revised for upgraded 10 Teraflops (TFs) systems. This crucial delay and non achievement of target was besides financial constraints, due to delay in supply of critical components by the vendors of C-DAC.

11. The Committee are disappointed to learn that C-DAC has missed the target of commissioning 5 Teraflops (TFs) systems. It is even more worrisome when technology is changing very fast and any delay can seriously jeopardise a project and subsequently result in not only cost overruns but also costly delays in nation building efforts which cannot be quantified. The country is already facing shortage of advanced computing infrastructure and in such a background any slippage in development of new infrastructure is disappointing. The Committee, therefore, emphasise that C-DAC should attach highest priority to such projects and complete them on time, if not before. The Committee also expect DIT to be fully supportive of all such endeavours of C-DAC so that there is no scope for any slippages.

12. The Committee also desire that DIT/C-DAC should take suitable action against such defaulting vendors. They would like to be informed of the precise action taken in the matter.

13. The Committee further note with serious concern that the 10 Gbps interconnect project could not be completed by C-DAC as per stipulated deadline i.e. December, 2006 and had to be staggered. This is not a healthy state of affairs, particularly when it concerns project of high value to the developmental efforts of the country. The Committee, therefore, desire that a time bound schedule be presented to them about the operationalisation of the 10 Gbps interconnect system.

(ii) Requirement of Supercomputing Resources and constraints

14. The Committee note that there is a serious short supply of supercomputing resources in the country. The Committee have been informed that various steps proposed to be taken takes to meet the supercomputing resources requirement like building large supercomputing facilities, Grid enabling HPC infrastructure, etc. However, C-DAC submitted that it is facing some constraints like non availability of necessary infrastructure, funds and skilled professionals in this regard and have taken up the matter with DIT. Further, the Committee have been informed that utilization of PARAM Padma is approximately 70%. The Committee are of the opinion that since India is a leading light in IT revolution, more and more multi national corporations (MNCs) involved in high end research are making it as their R & D base. To further boost R & D activities by Government and private sector, varied infrastructural support is needed and supercomputing facilities are one among them.

However, the Committee note with concern that the country is facing severe shortage of supercomputing resources. To aggravate the situation further, C-DAC are facing shortage of funds, infrastructure and skilled manpower and therefore are seriously constrained in meeting the requirements of supercomputing resources. In the opinion of the Committee this situation deserves to be remedied forthwith. The Committee, therefore, recommend, even at the cost of repetition that the Department should provide C-DAC with adequate funds and infrastructural facilities for the purpose of development of requisite supercomputing resources. Further C-DAC on its part should make efforts to attract talents in supercomputing field by tying-up with institutions of excellence and also take necessary steps for optimum utilization of Super Computing Resources presently available with it.

VII. Grid Computing

15. The Committee note that C-DAC have initiated the national grid GARUDA with noble objectives, notably sharing of high-end computational resources, addressing the requirements of emerging High Performance Computing applications and creating a collaborative framework for solving applications. The Project has, however, got delayed due to various reasons, chief amongst them being delay in building a culture of grid computing and stablisation of grid. C-DAC has submitted that these primary constraints are being resolved by arranging workshops and demonstrating advantages of Grid computing. The Committee feel that C-DAC should have adopted a more proactive approach and planned workshop, courses and grid partners meets before hand to avoid such a situation. Apparently, C-DAC has failed to visualise these eventualities, which is unfortunate. Timely steps in this regard would have created adequate environment and generated enthusiasm in grid partners. Therefore, the Committee would like to impress upon C-DAC that it should take all possible care and measures to avoid any further delay in the project and in future adopt a proactive approach towards such projects of great national importance.

VIII. Cyber Security

16. C-DAC with wide experience in R&D in Communications & Information Technology and electronics is delivering multi-level/ multi- layered cyber security solutions. In furtherance of its objectives in the field of cyber security it has also developed and released some products and tools. However, the Committee have been

informed that C-DAC tools are more useful for offline detection and still lack capability to tackle cyber crimes online. Beside, C-DAC admitted during the evidence before the Committee that these tools/ technologies still lack international standards. This is not a happy situation at all. More so, when India is faced with serious and continuous threats of cyber crimes against her and various law enforcement & forensic agencies of the country are increasingly looking to C-DAC for solutions. Therefore, it becomes all the more pertinent for C-DAC to timely develop multiple application cyber security technologies and tool of international standards. The Committee would impress upon C-DAC to priortise 'cyber security' area and develop robust technologies to safe guard Indian cyber installations against cyber crimes of all kinds.

IX. Multilingual Computing

(i) Lack of standardisation and lexical resources

17. It is heartening to note that in pursuance of their objective of making technology available to public at large in their own native language C-DAC is actively working towards design, development and deployment of technologies/solutions in the field of multilingual computing. An estimated 15-20 million users are benefiting from C-DAC's GIST-Graphics and Intelligence based Script Technology for last over one and a half decade. The Committee, however, note that the multi-lingual products of C-DAC are yet to find favour with most of the State Governments. C-DAC is facing some difficulties in this regard, these *inter-alia* include lack of standardisation & lexical resources. As for the reasons, firstly only a few states have standardised on some of the C-DAC's multilingual products because their requirement is a mix of products and tools and secondly, the states have alternative option to use products from MNCs. To overcome these constraints C-DAC plans standardisation meetings and establishing linguistic resource development centres. The Committee are of the view that besides standardisation meetings, these matters should be actively taken up with the respective State Governments to enlist their support not only in evolving common standards but also establishing linguistic resources in respect of all scheduled languages. Further, if necessary these matters may be raised in inter-state fora like National Development Council, Ministers' level meetings, Conference of Secretaries, etc. C-DAC, on its part ought to also customise its products to the requirements of respective states.

18. The Committee also feel that C-DAC should take further initiatives in extending the benefits of multilingual computing to common man. They would like C-DAC to accord due priority to Speech Recognition and Text to Speech projects as in the present scenario they can be of immense utility to the people at large. The Committee would also like the Department to not only monitor these projects continuously but also ensure that they suffer in no way due to paucity of funds or other impediments.

(ii) Non-availability of skilled manpower in computational linguistics

19. The Committee have been informed that working in language technology area requires computational as well as linguistic skills and it is difficult to get relevant manpower. The general trend being that freshers are not keen in working in domain specific language technology. C-DAC has submitted that these constraints may be overcome by starting computational linguistics programme in Universities & C-DAC centers, etc. The Committee are of the opinion that C-DAC should tie-up with Universities for respective languages and provide necessary support in starting computational linguistics programmes on a priority basis. Additionally, with support from the Department, C-DAC may establish development labs/centres at the campus of Universities for training and recruiting the requisite manpower beside development of linguistic tools/technologies so that this critical resource for multilingual computing is available in abundance.

X. Education and Training

20. The Committee have taken note of some reports projecting an estimated demand for 8,50,000 IT professionals and 1.4 million ITES-BPO professionals by 2010. However, in the current scenario due to various reasons, many graduates coming out of academic institutions are unable to meet the IT industry's requirements. The Committee have been informed that C-DAC with the help of about 50 training centres is offering various education and training programmes to build and enhance skills in critical areas of Information Technology, therefore, playing an important role in making available skilled workforce. Further, C-DAC is conducting various industry oriented education programmes and looking at the growing demand from industry, they are open to expand their training network to make available greater number of skilled manpower to the IT industry. However, large scale increase in its activities may not be viable with existing infrastructure. C-DAC is, therefore, looking into the mode of e-learning solutions in this area. The Committee appreciate the coordinated efforts of C-DAC and the

vital role being played by C-DAC in creating high quality manpower for ICT industry. They would, however, simultaneously like to impress upon C-DAC to further expand its network of training centres by expeditiously including more and more authorised training centres in it. Further, in view of the huge estimated demand of the industry, C-DAC should start e-learning courses without any further delay. The Department, on their part, should make available adequate funds to C-DAC for this purpose so that the valuable initiatives of C-DAC in this direction bear fruits forthwith. The Committee would like to be kept informed about steps taken in this direction.

XI. Health Informatics

21. The Committee note with appreciation the laudable contributions of C-DAC in the field of health informatics and related fields. A small but significant beginning has been made in developing remote software diagnostic assistance for cancer patients in rural areas of Kerala through Regional Cancer Center, Thiruvananthpuram. The Committee are sure that C-DAC will ensure a quick dissemination of this Scheme to other parts of rural India.

22. The development of Ayusoft Solutions is another feather in the cap of C-DAC. The Committee are sure that C-DAC will take this project to its logical conclusion by spreading knowledge of the ancient system of Ayurved to every corner of the globe so that the mankind benefits therefrom.

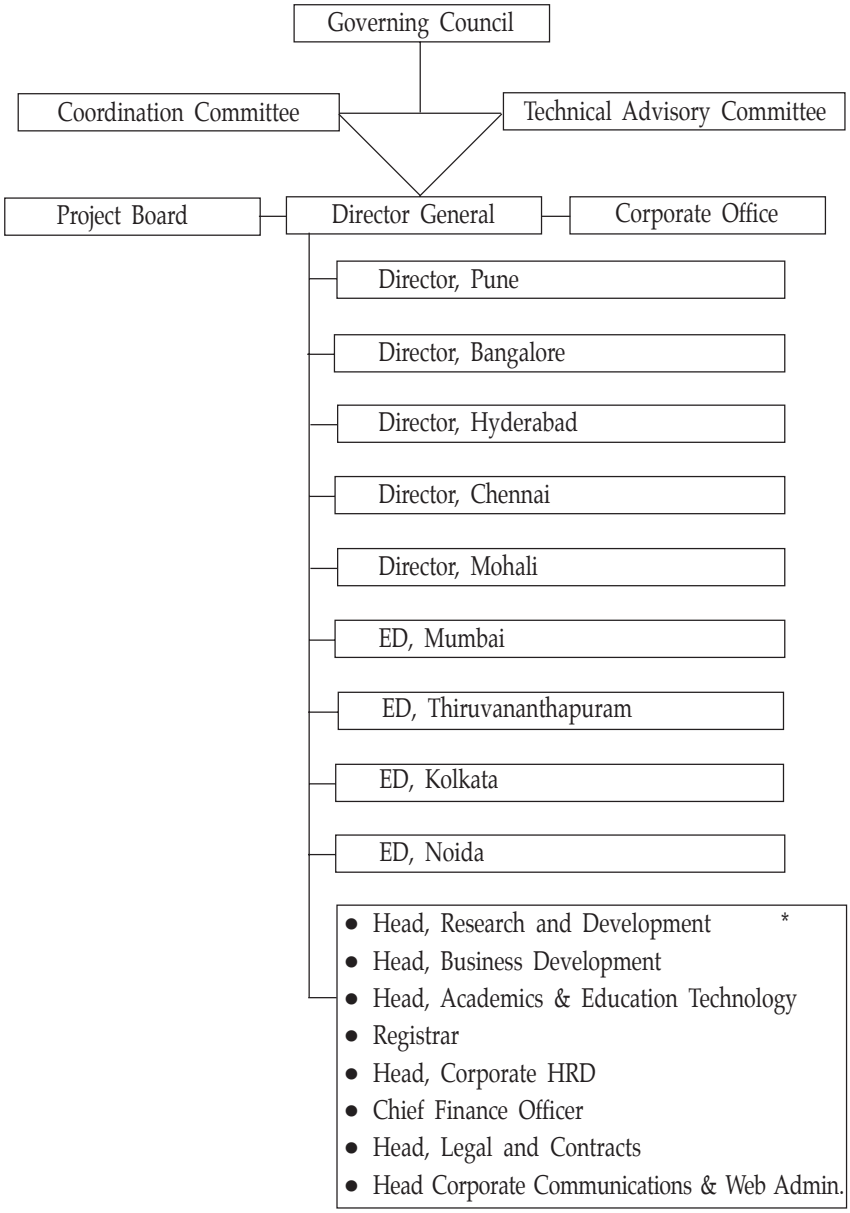
23. Last but not the least, the Committee have noted the efforts of C-DAC in the direction of evolving a Rural Health Management Information System for Primary Health Care. Inspite of concerted attempts of Government the primary health care in rural areas is not only in crying need of better management but of complete overhaul. A Rural Health Management Information System will go a long way in improving the reach, spread and efficacy of the primary health care and in the process the lot of teeming millions in our rural areas. The Committee desire top priority to this venture by C-DAC and DIT. They would like to be apprised of the roadmap charted out for the expeditious fructification of the System at the earliest.

NEW DELHI;
2 *August,* 2007
11 *Sravana,* 1929 *(Saka)*

NIKHIL KUMAR,
Chairman,
Standing Committee on
Information Technology.

APPENDIX I

CORPORATE HEADQUARTERS

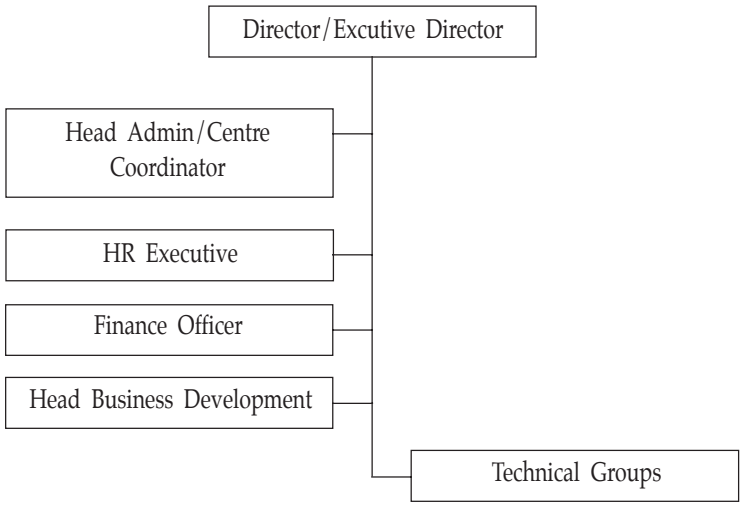


*Many of these positions have been already proposed (Being non-existent) or filled up by eisting members on part time basis.

APPENDIX II

CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTRING

CENTRES HEADED BY EXECUTIVE DIRECTORS/DIRECTORS



ANNEXURE I

MINUTES OF THE TWENTY FOURTH SITTING OF THE STANDING COMMITTEE ON INFORMATION TECHNOLOGY (2006-07)

The Committee sat on Tuesday, 4th July, 2007 from 1500 hours to 1830 hours in Committee Room G-074, Parliament Library Building, New Delhi.

PRESENT

Shri Nikhil Kumar — *Chairman*

MEMBERS

Lok Sabha

2. Shri Abdullakutty
3. Shri Nikhil Kumar Chaudhary
4. Shri Sanjay Dhotre
5. Shri Lalmani Prasad
6. Shri Tufani Saroj
7. Shri P.C. Thomas
8. Shri Narahari Mahato
9. Shri Badiga Ramakrishna
10. Shri Ramesh Dube

Rajya Sabha

11. Shri Praveen Rashtrapal
12. Shri Ravi Shankar Prasad
13. Shri A. Vijayaraghavan
14. Shri N.R. Govindarajar
15. Shri Motiur Rahman
16. Shri Eknath K. Thakur

SECRETARIAT

1. Shri P. Sreedharan — *Joint Secretary*
2. Shri P.C. Koul — *Deputy Secretary*

Representatives of the Videsh Sanchar Nigam Ltd. (VSNL) and Tata Teleservices Ltd. (TTSL)

1. Shri N. Srinath	—	Managing Director, VSNL
2. Shri Mukund Rajan	—	Director, TTSL & VSNL
3. Shri Ashok Sud	—	President, Corp. Regulatory, TTSL
4. Shri Shrinivasa Addepalli	—	Vice President, Corp. Strategy, VSNL
5. Shri Praveen Sharma	—	Vice President, Regulatory Affairs, VSNL

Representatives of the Department of Information Technology (DoIT)

1. Shri Jainder Singh	—	Secretary, DoIT
2. Shri S. Ramakrishnan	—	DG (C-DAC)
3. Shri M.M. Nambiar	—	Addl. Secretary, DoIT
4. Shri R. Chandrasekhar	—	Additional Secretary, DoIT
5. Shri E.K. Bharat Bhushan	—	Joint Secy. & Fin. Advisor, DoIT
6. Shri Pankaj Agrawala	—	Joint Secretary, DoIT
7. Dr. U.P. Phadke	—	Advisor, DoIT
8. Dr. A.K. Chakravorti	—	Advisor, DoIT
9. Dr. Gulshan Rai	—	Exec. Director-ERNET
10. Shri J.K. Tyagi	—	Deputy Financial Advisor, DoIT
11. Shri V.B. Taneja	—	Sr. Director, DoIT
12. Shri A.B. Saha	—	Exec. Director (C-DAC)
13. Shri Rajan Joseph	—	Exec. Director (C-DAC)
14. Shri Zia Saqib	—	Exec. Director (C-DAC)
15. Shri S.P. Dixit	—	Director (C-DAC)
16. Shri N. Mohananram	—	Director (C-DAC)
17. Dr. George Varkey	—	Director (C-DAC)

2. *** *** ***

3. *** *** ***

4. *** *** ***

5. *** *** ***

The witnesses, then withdrew.

6. The Chairman, then welcomed the Secretary, DoIT and other officers accompanying him to the sitting of the Committee.

7. Thereafter, the Director General, Centre for Development of Advanced Computing (C-DAC) gave a presentation on 'Functioning of Centre for Development of Advanced Computing (C-DAC)'.

8. The Members sought certain clarifications on the issues relating to the functioning of C-DAC. The representatives of the DoIT & C-DAC responded to the same.

9. A list of queries pertaining to the issue of functioning of C-DAc which could not be clarified during the examination of the witnesses was then handed over to the concerned officer of DoIT for written replies.

10. The Chairman thanked the witnesses for appearing before the Committee and furnishing valuable information in connection with the examination of the subject 'Functioning of C-DAC'.

The witnesses, then withdrew.

A verbatim record of the sitting has been kept separately.

The Committee, then adjourned.

***Matter not related to this report.

ANNEXURE II

MINUTES OF THE TWENTY NINTH SITTING OF THE STANDING COMMITTEE ON INFORMATION TECHNOLOGY (2006-07)

The Committee sat on Thursday, the 2nd August, 2007 from 1500 hours to 1530 hours in Committee Room G 074, Parliament Library Building, New Delhi.

PRESENT

Shri Ravi Shankar Prasad — *Acting Chairman*

MEMBERS

Lok Sabha

2. Shri Abdullakutty
3. Shri Nikhil Kumar Chaudhary
4. Shri Sanjay Shamrao Dhotre
5. Shri Tufani Saroj
6. Shri Tathagata Satpathy
7. Shri K.V. Thangka Balu
8. Shri Narahari Mahato

Rajya Sabha

9. Shri Motiur Rahman
10. Shri Shyam Benegal

SECRETARIAT

1. Shri P. Sreedharan — *Joint Secretary*
2. Shri P.C. Koul — *Deputy Secretary*

2. In the absence of the Chairman, the Committee under rule 258(3) of the Rules of Procedure and Conduct of Business in Lok Sabha choose Shri Ravi Shankar Prasad to preside over the meeting.

3. At the outset, the Chairman welcomed the Members to the sitting of the Committee. The Committee then took up for consideration

the following Draft Reports and adopted the same with some modificaitons:

(i) *** *** ***

(ii) Draft Report on 'Functioning of Centre for Development of Advanced Computing (C-DAC) relating to the Department of Information Technology (DoIT).

4. As the House was not in Session, the Committee decided to present the above said Reports to the Hon'ble Speaker under Direction 71(A).

5. The Committee, then, authorised the Chairman to finalise the two Reports in the light of factual verifciations received from the concerned Departments and present them to the Hon'ble Speaker on a date and time convenient to him.

The Committee, then, adjourned.

***Matter not related to this report.