

Centre for  
Telematics and  
Information  
Technology  
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The Netherlands

# ***ANNUAL REPORT 1994***

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The Centre for Telematics and Information Technology (CTIT) has been established on January 20th, 1994 by the Dutch Minister of Education, Culture and Sciences.

The institute's area of research comprises the design of complex telematic and information technology (T&IT) systems, including their embedding in the user environment. A primary objective is to perform multidisciplinary and interdisciplinary research projects. The cohesive elements are a methodological and formal approach to the design of complex T&IT systems, the formal modelling and optimization of user environments, and the support of these methods and approaches with advanced software and hardware tools.

This Report gives a review on the research policy of the institute (section 1), the role of the CTIT within the University (section 2), organizational and managerial aspects of the institute as a whole (section 3), the institute's finances (section 4), as well as an account of the activities of the first year (section 5 through 10).

### **1. Policy**

The CTIT aims at becoming an international *centre of excellence*, where eminent scientific research is performed, which is internationally acknowledged. For a period of more than ten years, there has already been a substantial participation in the European research programmes, such as ESPRIT and RACE, by groups that now join forces within the CTIT. New research projects within the Fourth Framework programme of the European Union are prepared and carried out, as well as projects (partly) financed by the Dutch government. Cooperation with industry is going on.

A second objective is to create a stimulating research environment for training and educating Ph.D.-students. For this purpose the CTIT took in

April 1994 the initiative to establish a nationwide graduate school with similar goals as the CTIT; this school is now in its formative phase (Onderzoekschool Telematica & Informatietechnologie, acronym: OTI). Its main components are the University of Twente and the Technical University of Delft, together with some relevant academic research groups of different universities in the Netherlands. This school is supported by the Telematics Research Centre, an independent research institute in the area of telematic systems, applications of telematics and the social conditions of large-scale use of these applications (this institute is funded by the telecommunications and IT industry and the Ministries of Economic Affairs and Education, Culture and Sciences).

A third objective is to contribute to the educational programmes of the university departments involved and provide a sound basis for the development of new studies, such as *Business Information Technology*, which has been established, and *Telematics*, which will be developed in the near future. Also, two post-graduate engineering programs with a duration of 2 years are currently running (*Information Technology* and *Tele-Informatics and Open Systems*).

## **2. Role of the CTIT within the university**

It is the University's policy to foster multidisciplinary research between the two nuclei of the university: the technical sciences on the one hand and the social sciences on the other hand. The CTIT philosophy fits well into this policy. The CTIT, as a research institute, is a new organizational entity within the University of Twente. It combines the research efforts related to Telematics and Information Technology of seven departments; the resources (referred to as the "federative parts") have been allocated to the CTIT for a period of five years at the formation of the institute.

At the start of the institute there existed only collaboration on a bilateral basis and on a limited scale between the participating departments. The first and major challenge of the institute is to bring about cohesion in the research by means of so called 'integration projects', which are multidisciplinary by definition.

### 3. Organizational structure, management and administration

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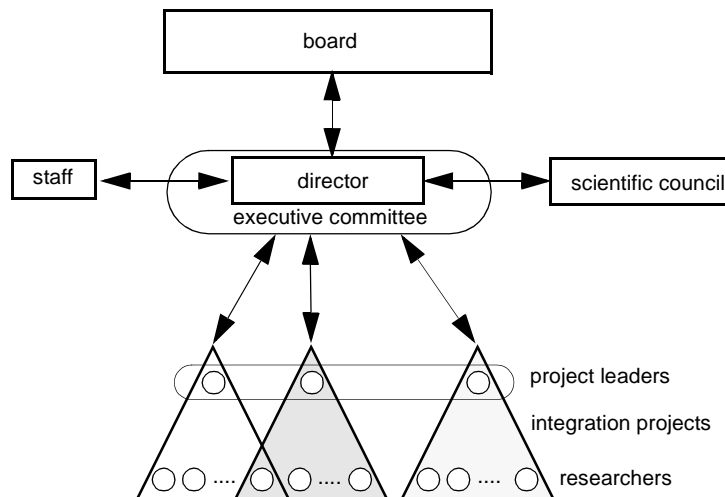
#### 3.1 Organizational structure

The CTIT organization consists of:

- the board of the institute
- the scientific director, assisted by:
- the executive committee
- the staff
- the scientific council
- projects with their project leaders

In this chapter the role of each of these elements will be explained. Also attention will be given to the role of the administrative department and the participating departments.

The organizational structure of the institute can be depicted as follows:



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#### 3.2 Board

The research institute is directed by the Board of the institute; the scientific director who is accountable to the Board, is charged with the day-to-day

management of the institute and the preparation of the institute's policy. The Board consists of up to five members. Initially four members are nominated by the participating departments, being: Prof. Dr.-Ing. P.J. Kühn (Chairman, University of Stuttgart, F.R.G.), Prof. Dr. E.J. Neuhold (GMD-IPSI, Darmstadt, F.R.G.), Prof. ir. M. Antal (director of Eurescom, Heidelberg, F.R.G.) and Prof. ir. W. Zegveld (Rathenau Institute, Den Haag, NL).

#### *Tasks of the Board*

The Board supervises the research policy, the institute's finances and the performed research of the CTIT at a global level. It assesses the five-yearly general research plan, the annual research plans and the annual budget allocation. The Board will present the financial results on an annual basis to the participating departments.

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### **3.3 Director and Executive Committee**

The director is assisted in his management tasks by a small executive committee, which he presides. The mainstream activities of the institute are represented in this body. Presently, the executive committee consists of: prof. dr. ir. I.G. Niemegeers (Chairman, director of the CTIT and member of the Tele-Informatics and Open Systems group of the departments of Computer Science and Electrical Engineering), prof. dr. P.M.G. Apers (member, Information Systems group, department of Computer Science), and prof. dr. ir. J.H.A. de Smit (member, Stochastic and Operational Research group, department of Applied Mathematics, also representing the non-engineering departments).

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### **3.4 Staff**

In order for the institute to act decisively, it is important that tasks that are most closely linked to the institute's policy are performed by a small executive staff around the director. In all his tasks the director is assisted by an Institute Manager (ir. J. van de Lagemaat) and an Assistant Manager (drs. W.G. Hiddink). The role of the staff is to build up the institute in all its aspects, which comprises policy making and realization, project acquisition and project acquisition support, project management, organization of workshops, seminars and conferences, public relations. Both are closely involved in all aspects of the research policy and familiar with all develop-

ments taking place within the institute. Overall secretarial support is given by the institute's secretary (Mrs. M.G.M. Castañeda).

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### 3.5 Scientific Council

The Scientific Council consists of senior researchers, which represent all disciplines within the scope of the CTIT. Also two external members have been nominated, as well as one student representative. It advises the executive committee and the scientific director on its research strategy and formulates new ideas on future research projects. Furthermore, it acts as a scientific review board. To this end it will provide at the end of each year a review report. The Scientific Council will meet approximately five times per year. The Scientific Council has formally been established in 1995.

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### 3.6 Projects and Project Leaders, Autonomous versus Federative

Each research institute of the University of Twente consists of so-called *autonomous* components and *federative* components. Federative research encompasses the contribution of the participating departments to the institute; for the main part this is regular university personnel, for their research placed under the responsibility of the research institute. Autonomous components encompass the institute's staff and scientific personnel, appointed for projects which have been acquired by the institute itself.

The formal coordination of *federative* parts is in the hands of the director of the CTIT, but the participating groups still have a large amount of independence in carrying out the research; financial means remain part of the participating departments. Federal projects are in general monodisciplinary. For *autonomous* parts, the director of the institute has the complete authority and responsibility; financial means are allocated to the institute itself. Projects are in general multidisciplinary. Research projects can be federative or autonomous as well. This will be determined in agreement with the scientific director at the start of the project.

The way of operating of the CTIT is in the starting phase largely federative, due to the contributions of seven university departments. It is, however, the

intention to organize the integration projects as homogeneous, autonomous projects. This can be achieved as external funding is acquired for (part of) the research, so projects can be realized with funding which is independent of the departments. It is expected that there will be a gradual development towards autonomy during the first period of five years.

In 1994 all projects within the CTIT had a federative character. Initiatives for new projects (see overview of 1994 activities) have largely an autonomous character, with participation of federative parts. In february 1995 the first personnel has been appointed by the CTIT itself.

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### **3.7 Management and Administration**

Since January 1st, 1995, the CTIT has become an autonomous administrative unity. As such the institute is independent from the participating departments for the autonomous part of the institute. The director is fully authorized for this part. For the so-called *federative* parts the scientific director is only authorized to manage the *use* of the resources (mainly manpower).

All formal aspects with respect to the management and administration of institutes of the University of Twente are described in the University's memorandum "Autonom en federatief. Bestuur en beheer instituten" (English: "Autonomous and Federative. Management and Administration of Institutes", 1994) and the Constituent Document of the CTIT.

As the institute is a kind of 'shell' organization around the participating groups, with a large involvement of the administrative department of Computer Science, it is not the intention to duplicate the administration of this department. Therefore, a lot of tasks at an administrative level and resulting from the institute director's mandate will be performed by the administration of the department of Computer Science, in particular the appointment of the institute's personnel, the administration of finances, assistance in financial affairs and the effectuation of payments.



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### 3.8 Participating groups in the CTIT

The following departments and research groups within the departments are participating in the CTIT:

*Department of Computer Science:*

- Tele-Informatics and Open Systems group (interdepartmental group with the Department of Electrical Engineering)
- Information Systems group (Databases, Knowledge-based Systems, Design Methodology)
- Software Engineering and Theoretical Informatics group (Language Engineering)
- System Software and Computer Architecture group (Distributed Systems, Multimedia and Security; Architecture and Implementation of Digital Systems)

*Department of Electrical Engineering*

- Tele-Informatics and Open Systems group (interdepartmental group with the Department of Computer Science)
- Laboratory for Network Theory

*Department of Applied Mathematics*

- Stochastic and Operations Research group

*Department of Educational Sciences*

- Educational Instrumentation

*Department of Philosophy and Social Sciences*

- Ergonomics

*Department of Business and Management Sciences*

- School of Management Studies

*Department of Public Administration*

- Management and Finance

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### 3.9 Contribution in manpower per department

The contribution in manpower of each department in the first year of operation is shown in Table 1. The units of manpower are fte's (full time equivalents, i.e. manyears). This effort is allocated for the whole institute period of 5 years.

department	1st (direct) funding	2nd (indirect) funding	3rd (external) funding	total
Computer Science	34.75	3.2	21.15	59.1
Electrical Engineering	15.15	4.5	1.6	21.25
Applied Mathematics	1.8			1.8
Educational Sciences	1.02			1.02
Business & Management Sciences	0.9			0.9
Public Administration	1.0		1.0	2.0
Philosophy and Social Science	1.2			1.2
total	55.82	7.7	23.75	87.27

*Table 1: Contribution in manpower per department*

## 4. Institute's finances

The Institute's budget in 1994 largely consisted of the capitalization of input of the federative parts of the Institute. It is shown in Table 2 for the federative part, and Table 3 for the autonomous part. The units are DFL.

Federative part (in kDFL)				
Department	1	2	3	total
Computer Science	5.828	409	2701	8.937
Electrical Engineering	2.845	104	426	3.375
Applied Mathematics	192			192
Educational Science	68			68
Business & Management Sciences	103			103
Public Administration	115	75		190
Philosophy and Social Science	138			138
total	9.289	588	3.127	13.003

*Table 2: Federative part of the first year budget (in kDFL)*

The Department of Computer Science paid for the housing expenditures and computer support of the CTIT-staff.

### *Autonomous part*

No central budget was made available for 1994; a starting budget of 70 kDFL has, however, been granted. For 1995 a central budget of 200 kDFL has been allocated to the institute. The Department of Computer Science granted a subsidy of DFL 2.000 for the organization of the CTIT Workshop.

The Tele-Informatics and Open Systems (TIOS) group of the Departments of Computer Science and Electrical Engineering paid the salaries of the Institute Manager and Assistant Manager and part of the travel costs. With respect to the payment of these salaries, an arrangement with the TIOS-

group has been made for a gradual transition to the CTIT. The Department of Computer Science paid half the secretary's salary, the remaining part being paid by the CTIT itself.

Autonomous part (in kDFL)			
expenditures		budgets	
salaries	180.0	initial budget	70.0
travel costs	25.5	contribution Dept. of	14.5
general expenses	43.5	Computer Science	
result	10.8	contribution TIOS	175.3
total	259.8		259.8

*Table 3: Autonomous part of the first year budget (in kDFL)*

## **5. Overview of 1994 Activities**

The first year of the existence of the CTIT can be regarded as a transitional phase, in which many lines of policy had to be worked out. Attention was given to shaping of the organizational structure of the CTIT, the acquisition of external projects, to start and to bring about coherence in multidisciplinary research activities, initiatives to start a nationwide Graduate School and public relations.

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### **5.1 CTIT Workshop, January 25, 1994**

On January 25, 1994 a CTIT "kick-off" Workshop has been held at the "Holtweijde" in Lattrop. There were 90 participants, all coming from departments involved in the CTIT. There were several presentations given on different research activities within the CTIT; furthermore it was discussed how research of the respective departments should be bundled into integration projects. It is the intention to organize a CTIT Workshop once per year; this is regarded essential for the internal coherence of the research institute.

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### **5.2 Meetings of the Board**

#### **First meeting of the Board, June 24, 1994**

The first meeting of the Board of the CTIT took place on 24 June, 1994, in Enschede. Discussions have been on the role and tasks of the Board, the research programme of the CTIT, the organization of the CTIT, current activities, and the advisability of establishing a European network of Telematic Institutes.

#### **Second meeting of the Board, October 4, 1994**

The second meeting of the Board was held on 4 October 1994 in Darmstadt (F.R.G.). At this meeting Prof. dr.-Ing. P.J. Kühn was formally appointed as Chairman. The research strategy of the CTIT was discussed, as well as the role of the Institute's Scientific Council.

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### 5.3 Ongoing projects

With respect to research carried out in the federative part of the institute: this has been mainly a continuation of research carried out before the start of the institute within the respective departments (the so-called "aanloop-projecten"). It concerns the following federative projects:

*Departments of Computer Science and Electrical Engineering:*

- 1 Mobile Networking (INF/EL: TIOS) (2.5 fte)
- 2 Protocolmechanisms, Signalling and Control in B-ISDN (INF/EL: TIOS) (5.3 fte)
- 3 Integrated Service Engineering (ISE) (INF/EL: TIOS) (4.1 fte)
- 4 Tools and Techniques for Performability Modelling of Distributed Systems (INF/EL: TIOS) (3.0 fte)
- 5 Human-Computer Interfaces (INF: TIOS) (1 fte)
- 6 Software Development Environments (INF: TIOS/SETI) (3.6 fte)
- 7 Highspeed Broadband Optical Networks for Real-time Multimedia Applications (INF/EL: TIOS) (8.05 fte)
- 8 Computer Supported Co-operative Work (CSCW) (INF/EL: TIOS) (1.3 fte)
- 9 Design- and Structuring Techniques for Open Distributed Systems (INF/EL: TIOS) (3.5 fte)
- 10 REACT (INF: TIOS/SETI) (1.35 fte)
- 11 Formal Specification of Distributed Information Systems (INF: TIOS/IS) (1.1 fte)
- 12 Formal Methods for Open Systems (INF: TIOS) (2.15 fte)
- 13 Knowledge Based Systems (INF: IS) (8.3 fte)
- 14 Databases (INF: IS) (11.2 fte)
- 15 Design Methodology (INF: IS) (4.3 fte)
- 16 FADE (INF: SPA) (0.7 fte)
- 17 Huygens-Pegasus-Broadcast: ATM-based multimedia systems (INF: SPA) (5 fte)
- 18 TRADES: Transformational Design (INF: SPA) (1.2 fte)
- 19 Parlevink: Linguistic Engineering (INF: SETI) (6.5 fte)
- 20 Reliability and Quality of (VLSI) Systems and Circuits (EL: BSC-NT)

- (3.85 fte)
- 21 Computer Supported Design Methodology for VLSI Systems (EL: BSC-NT) (4.0 fte)
  - 22 Algorithms and Systems for Digital Signal Processing (EL: BSC-NT) (4.45 fte)

*Department of Applied Mathematics:*

- 23 Stochastic Models for the Performance- and Reliability Analysis of Telematic Systems (TW: STOR) (1.6 fte)
- 24 Communication Complexity of Sum-Type Functions in Distributed Computing (TW: STOR) (0.2 fte)

*Department of Educational Sciences:*

- 25 On-line learning: The Instrumentation of Telecommunications-mediated Learning Environments (TO: ISM) (1.02 fte)

*Department of Business & Management Sciences:*

- 26 Situation-Dependency of the Analysis- and Design Process (TBK: BIK) (0.4 fte)
- 27 DECO: Design Concepts for CSCW-systems (TBK: BIK) (0.2 fte)
- 28 Law and Information Technology in a Managerial Context (TBK: Bedrijfsrecht) (0.3 fte)

*Department of Public Administration:*

- 29 Scenarios for "Smart Cards" in Health Care (BSK: MF) (2 fte)

*Department of Philosophy and Social Sciences:*

- 30 Modelling the Presentation Interface (WMW: Ergonomics) (1 fte)
- 31 INTACT (INterdisciplinary Theoretical Approaches to Cooperation Technology) (WMW: Ergonomics) (0.2 fte)

The results of this research have been accounted for in the yearly reports of the respective departments. It is the intention that in the future these results will appear as part of the yearly report of the CTIT.

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## 5.4 Initiatives for new research projects

At the start of the CTIT two large scale *integration projects* have been formulated: CSCW (Computer Supported Cooperative Work) and HIS (Hospital Information Systems). As can be concluded after one year, it turned out to be difficult to acquire external funding for such large-scale projects. Such projects are not only capital intensive (because of their large scope), but also the basic assumption of a multidisciplinary approach is quite new for the funding bodies. Projects that were submitted, did not fit well into current research programmes. It appeared to be easier to acquire funding for small, separate parts. It is not expected that funding authorities will alter their funding policy within the short term. Therefore, the policy of project definition has to be, or in some cases has already been, adapted.

Another strategy to achieve integration projects is to define *focal points* of multidisciplinary research. At each focal point, doctoral research on complementary topics will be carried out by Ph.D.-students from different departments. They will closely cooperate and be supervised by professors from the departments involved. It is the intention to let these focal points grow by assigning new Ph. D.-positions (from the 1st, 2nd and 3rd flow of funds) to these focal points.

A first focal points has been defined around "Next generation Hospital Information Systems", between Electrical Engineering and Computer Science, where at this moment two Ph.D.-students cooperate. Three more focal points have been defined and will be funded by budgets allocated by the University's Board under their incentives policy (see "Projects funded by the University", page 12). Also in these kind of projects, autonomous and federative parts are closely linked (Ph.D.-students can be funded out of the regular budgets of the departments, external funding by NWO/STW etc., and University funding for incentives policy).

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### 5.4.1 INTEGRATION PROJECTS

In the following sections an overview on the 1994 activities with respect to integration projects will be given:



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## **CSCW**

The CSCW project incorporates research in the areas of Tele-Working, Tele-Education, Design for Manufacturing, and Work-flow Management. Research on these subjects has been carried out until now in a scattered way within the departments involved. It is the aim to bundle these activities into one project.

Participating departments are: Computer Science, Business & Management Sciences, Educational Sciences, Philosophy and Social Sciences. The Telematics Research Centre is also involved.

A cycle of ten presentations has been organized in the first half of 1994, which aimed at informing each other on the respective research topics. This lecture cycle has been a success. All presentations will be bundled and published in the CTIT-Technical Reports Series, and shall also be made available electronically.

It was decided that the CSCW research will be carried out in a small number of projects which will be globally coordinated.

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## ***Hospital Information Systems***

*(Project leader: Prof. dr. S.J. Mullender)*

Hospital Information Systems are large, complex, critical distributed systems, that have an extensive influence on the organization and social context in which they are used. The development and effective use of advanced telematic and information technology systems for these systems can greatly reduce the costs society spends on health care. The aim of the Hospital Information Systems project is to do research on the development of highly reliable systems, and on the introduction and use of these systems in organizations in such a way that the quality and effectiveness of the organization improves in all its aspects. Within the HIS project a framework and methods for the design and implementation of future Hospital Information Systems will be developed, in close collaboration with relevant actors in the field (users, i.e. the Medisch Spectrum Twente [MST] hospital in Enschede, designers and suppliers of hospital systems, etc.).

An initial attempt to request funding via the OSF (**O**nderzoek**S**timulerings**F**onds, a budget to be allocated by the university for new research activities) did not succeed. Work is going on to define a new proposal in cooperation with the medical rehabilitation centre "Het Roessingh" in Enschede.

In the meantime, two Ph. D.-students already perform their doctoral research on this topic (see also § 3.3, page 8: Initiatives for research projects).

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#### **5.4.2 PARTICIPATION IN PROJECTS OF THE EUROPEAN UNION**

##### ***ESPRIT and RACE***

In 1994 several research groups of the CTIT participated in projects within the EU Research programmes RACE and ESPRIT. These projects all started in the pre-CTIT period. The results of these projects are reported under section 9 (scientific results).

##### ***COST***

The CTIT has become member of COST 247 on Formal Methods, and acts as one of the to Dutch members of the COST 247 management team. It is also involved in COST action 14 on Cooperation Technology (CO-TECH project: Computer Supported Cooperative Work).

##### ***Fourth Framework Programme***

In 1994 initiatives were started to form consortia for project proposals, to be submitted within the ACTS, ESPRIT and Telematics Programme of the Fourth Framework Programme. In the last months of 1994 a lot of effort has been spent on the definition of project proposals, the deadline being March 15, 1995.

CTIT has participated in the following proposals:

##### ***ACTS Programme***

- CAMPUS: on multi-media infrastructures and applications
- INSIGNIA: definition, implementation and demonstration of an advanced

architecture for network control functions involving Intelligent Network support

- TELETEAM: design and usage of tele-education applications
- TASQ-FORCE: Quality of Service architecture of multi-media applications
- ANIMAS: Network architectures for Wavelength Division Multiplexing
- VALIDE: validation on the basis of LOTOS
- TOBASCO: Wavelength Division Multiplexing for two way broadband communication in access networks

#### *ESPRIT Programme*

- ROMANCE: research in open multi-media and networked cooperative environments
- ALVIS: definition and building of an open and extendible system, offering advanced, versatile interpersonal mobile services, narrow-band and broadband, as a step towards integrated UMTS service
- WIDE: Workflow on Intelligent Distributed Database Environment

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#### **5.4.3 DUTCH NATIONAL PROJECTS**

##### **PLATINUM**

The Platinum projects (= PLATform providing Integrated services to New Users of Multimedia) aims at developing innovative multimedia applications, together with the underlying advanced broadband network architecture. Both user and technology perspectives are taken into account. As pilot application a tele-education application will be developed.

Partners in the project are AT&T, the Telematics Research Centre (TRC), the Centre for Telematics and Information Technology (CTIT) and Deutsche Telekom. The CTIT is subcontractor of AT&T.

The Platinum project is divided in two phases of 1,5 year. Phase 1 requires an investment of 15 mDFL for 78,5 fte in total, of which 5 mDFL funding has been granted by the Dutch Ministry of Economic Affairs. The CTIT participates in this first phase with 9 fte; 750 kDFL will be sponsored by the Min-

istry of Economic Affairs. For phase 2 (55,5 fte) it will be tried to accommodate the research in a project within the ACTS programme of the European Union. The project starts on January 1, 1995.

The following CTIT-groups are involved:

- Tele-Informatics and Open Systems group (departments of Computer Science and Electrical Engineering): Architecture group, Application Protocols group, Communications Systems group.
- Educational Instrumentation group (department of Educational Sciences)

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## ***SURFNET IV***

The CTIT participates in the SURFNET IV project, a collaborative pilot project of the "Stichting SURF" (Dutch Academic Network), the KPN (Dutch PTT), and the Dutch Universities for the introduction of a high speed network based on ATM. KPN will provide the national backbone network, as well as local ATM equipment.

This Dutch pilot project will be part of a European ATM pilot, which will be carried out by KPN together with 14 European PTTs. As such it will also be possible to test European ATM traffic.

The CTIT is involved in the following subprojects:

- Management aspects of networks (together with TU-Delft and KPN)
- Remote education and research (together with TU-Delft)
- Protocols, Signalling and Control in B-ISDN
- ATM aspects of Operating-System Support for Distributed Multimedia (together with CWI, Amsterdam and Cambridge University)
- ACUTE (together with CWI): development of protocol and application software, design of protocols for audio and video and the development of high-quality multimedia broadcasts of lectures.

Involvement of the CTIT:

- Tele-Informatics and Open Systems group (departments of Computer Science and Electrical Engineering): Management group, Application Protocols group, Communication Systems Group

- Systems Software en Architecture group (department of Computer Science)
- Educational Instrumentation group (department of Educational Science)

SURF has granted a subsidy of 200 kDFL to the CTIT; the department of Computer Science of the University of Twente stimulates the work with another 200 kDFL and the "Centrum voor Informatievoorziening" (CIV, the computer centre of the University of Twente), contributes with 100 kDFL.

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### ***IOP-proposal Optical Circuit and Packet Switched Networks***

A project proposal within the IOP-programme (=Innovatief Onderzoeksproject / Eng.: Innovative research project) "Electro-Optics" on Optical Circuit and Packet Switched Networks has been submitted. The IOP-programme is financed by the Dutch Ministry of Economic Affairs.

A decision is expected by March 1995.

Involvement of the CTIT:

- Tele-Informatics and Open Systems group (department of Electrical Engineering): Transmission Systems and Technology.

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### ***STW-proposal Multimedia applications, systems and transmission***

An STW (= (Dutch) Foundation for Technical Sciences) proposal on Multimedia applications, systems and transmission has been submitted. This proposal has been rejected. A part of this proposal on storage and transmission of high quality pictures has been taken separately and forms the basis of a new STW proposal.

### ***Land Water Impuls programme (LWI)***

The Land Water Impuls programme (LWI) is a technology programme of the Dutch Ministry of Economic Affairs. The total budget is 40 mDFL for the period 1994-1998.

The aim of the "Land Water Impuls" programme is to advance a permanent knowledge infrastructure, in which universities, technological institutes, construction firms, engineering offices, software houses and authorities cooperate.

The CTIT has expressed its interest to join this programme, however, the definition phase of possible projects has not yet come to an end. In case participation is considered, it will probably take place via the Telematics Research Centre.

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#### *5.4.4 UNIVERSITY FUNDING FOR SPECIAL INNOVATIVE ACTIVITIES*

The Board of the University awarded a budget for special innovative activities to the CTIT for a period of three years. This budget amounts to 250 kfl per year. The CTIT intends to spend this budget on three focal points of multi-disciplinary research, in order to advance the integration between groups within the CTIT (see section 5.4.0). Project proposals have been submitted to the Board of the University. The CTIT is presently waiting for approval.

At each of the defined focal points, Ph.D. students of different departments will work together within a specific research area, on complementary research topics, and will be guided by professors from the departments involved. The Ph.D.-students will work closely together with Ph. D.-students funded by the regular department's budget or by external funding.

The following focal points have been defined:

- Educational Instrumentation/ Telematics: Desktop Telelearning Environments (at this moment: one Ph.D.-Student at the department of Educational Sciences, one Ph.D.-vacancy at the CTIT)
- Applied Mathematics / Telematics: Evaluation of Performance and Quality of Service (at this moment: one Ph.D.-Student at the department of Applied Mathematics, two P.h.D.-vacancies (one AIO/one OIO) at the departments of Computer Science/Electrical Engineering, one Ph. D.-vacancy at the CTIT)
- Ergonomics / Information Systems: User interface for a multi-media database (at this moment: one Ph.D.-vacancy at the CTIT)

All three focal points will be extended in the coming years.

## **6. Graduate School OTI**

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In March 1994 initiatives have started to establish a nationwide graduate school within the area of telematics and information technology, called OTI (= Onderzoekschool Telematica en informatietechnologie). Initiators and principle partners are the University of Twente (Centre for Telematics and Information Technology) and the Technical University of Delft (department of Technical Management Sciences). Relevant research groups of other universities (Technical University of Eindhoven, Leiden University and the Centre of Mathematics and Computer Science) have joined this initiative. There is a strong liaison with the Telematics Research Centre (TRC); junior researchers of this independent research institute will also participate in the graduate school. Three different task forces, on research, education and infrastructure, have been created (Spring 1995).

## **7. Telematica stad Twente**

The CTIT also intends to expand its regional function. At the end of 1994 the CTIT was invited to participate in the "Telematica stad Twente" (=Telematics City Twente) initiative, a joint project between the University of Twente, the cities of Enschede, Hengelo and Almelo, PTT Telecom (Hengelo), Hogeschool Enschede, the "Kamer van Koophandel", the Overijsselse Ontwikkelingsmaatschappij (OOM/EFRO), Kabel Oost, Teleport Twente and the Telematics Research Centre.

The aim of the project is to use the existing infrastructure in the Twente region (telephone lines and cable) for (pilot) projects on telematic applications, with emphasis on which telematic services can be offered.

## **8. Public Relations**

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### **8.1 Policy**

The first important aim was to make the institute rapidly visible to the outside world. To this end a uniform house style was developed in the first month of existence. The visibility was further improved by the CTIT-infor-

mation brochure, drawn up at the same time, and the CTIT-Newsletter (in Dutch - distributed at a two-monthly interval). Later on ideas were developed on uniformity of style for a Ph. D.-Thesis series and a Technical Report series.

With the growth of Internet, a World-Wide-Web-site was regarded essential for information dissemination on the CTIT. This was established soon after the initial plans (URL: <http://www.tios.cs.utwente.nl/ctit/>). It contains information on the CTIT itself, the participating groups, qualifications, ongoing projects, calendar of events, CTIT publications, newsletters, vacancies, as well as links to interesting sites elsewhere (e.g. European Union: research programmes). The information has been gradually expanded.

Another objective is to improve the visibility by organizing workshops and seminars series at regular intervals. It is the intention to hold at least one workshop per year. The subject of the first and probably also the second workshop have been and will be of a more general nature, to inform the participants on which activities have taken/are taking place within the institute. In the future also workshops will be organized on specific subjects.

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## **8.2 Ph.D.-Thesis Series and Technical Report Series**

In September 1994, the first Ph.D. thesis in the CTIT Ph.D.-Thesis series was published: L. Ferreira Pires, *Architectural Notes: a Framework for Distributed Systems Development*. Later on ideas were developed on uniformity of style.

At the end of 1994, also preparations were made to issue a Technical Reports Series. The first reports will appear in 1995.

## **8.3 Newsletters**

At a two-monthly interval, internal Newsletters (in Dutch) on the CTIT are published. These newsletters contain all relevant information on the institute. With these newsletters we intend to inform all employees of the institute and the participating departments on what is going on in the CTIT. All these newsletters are accessible through our World-Wide-Web server as



well.

It is the intention to issue also an external Newsletter, at a three monthly interval. This external Newsletter will be in English and distributed to external relations of the institute. The information will be of a more general nature, as compared to the internal newsletters.

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#### **8.4 Seminars / workshops / conference**

The CTIT intends to improve its visibility by organizing workshops and seminars at regular intervals. A first workshop has been organized at the start of the institute (see page 6) and from April to September 1994 a series of seminars on Computer Supported Cooperative Work (CSCW - see page 7). A second series on the "Electronic Super Highway" (in cooperation with the Telematics and Open Systems Group of the Departments of Electrical Engineering and Computer Science) will take place in the beginning of 1995.

Also international workshops and conferences on specific subjects will be organized by the CTIT. For example, from 16 through 21 April 1995 the Seventh European Workshop on Dependable Computing (EWDC-7) on "Dependable Computing for Telematics" will be organized by the CTIT. Also, the CTIT is the prime candidate to host of the IEEE 802 Summer Conference in 1996.

## 9. Scientific results

Due to problems with the University Database System, the results could not be made available. They will be published separately.

## 10. Visiting scientists

J. Abate, AT&T Bell Laboratories, Holmdel NJ, U.S.A. (23-29 May 1994; Stochastic and Operations Research Group)

R. Bosua MSc, University of South Africa, Pretoria (1 February - 30 November 1994; Information Systems Group)

T.S. Chihara, Purdue University Calumet, Hammond IN, U.S.A. (4-9 November 1994; Stochastic and Operations Research Group)

Dr. Ph.F. Chimento, IBM Network Analysis Centre, Durham, USA (October 1994- October 1996; Tele-Informatics and Open Systems Group)

G.L. Choudhury, AT&T Bell Laboratories, Holmdel NJ, U.S.A. (23-29 May 1994; Stochastic and Operations Research Group)

Dr. E. Csuhaj-Varju, Hungarian Academy of Sciences, Budapest (3 months, 1994; Software Engineering and Theoretical Informatics Group)

Prof. B.G. Kim, University of Massachusetts at Lowell, (September 1993 - September 1994; Tele-Informatics and Open Systems Group)

Dr. June Hyoung Kim, Duksung W. University, Seoul, Korea (July 1, 1994 - July 1, 1996; Systems Programming and Architecture Group)

M.F. Neuts, University of Arizona, Tucson AZ, U.S.A. (23-29 May 1994; Stochastic and Operations Research Group)

Prof. dr. B. Pernici, Politecnico di Milano (6 June - 20 July, 1994; Information Systems Group)

Prof. B. Shackel, Loughborough University of Technology (1994; Ergonomics Group)

Prof. dr. M. Scholl, University of Ulm (May 1994, Information Systems Group)

W. Whitt, AT&T Bell Laboratories, Holmdel NJ, U.S.A. (23-29 May 1994; Stochastic and Operations Research Group)