Strategy of the National Institute for R&D in Microtechnologies

(medium term: 2009-2015**)**

1. Activity domain

The National Institute for Microtechnologies is active in **the micro- and nanotechnologies domain.** The object of activity includes also "nanotechnology", even if this term is not comprised in the institute name.

The current dominant trends at worldwide level are the following:

a) Reducing the dimensions and evolution from "micro" towards "nano"
b) Convergence of "micro-nano-bio-info" technologies
c) Applying of micro- and nanotechnologies in the conventional industries
d) Set up and develop high-level research and development infrastructures (technological and characterization facilities) which allow direct or indirect access of industry members and young researchers (usually PhDs) to equipments and know-how
e) Promoting the education and interdisciplinary training of researchers and also consolidating the entrepreneurial skills

2. Short history

The Institute for Microtechnology (IMT) was set up on July 23, 1993 (by reorganization of the Centre of Microtechnology, founded in 1991) by Governmental Decision No. 360, as unit coordinated by the Ministry of Education and Research. IMT had the headquarters at S.C. Microelectonica S.A. and used a part of the equipments and personnel of that company. **The National Institute for R&D in Microtechnologies (IMT Bucharest) was set up at the end of 1996** (Governmental Decision no. 1318/1996) by merging IMT with the former Institute of semiconductors electronics (ICCE), taking over the building, equipments and personnel of ICCE. At the end of March 1997, the direct activity in S.C. Microelectronica S.A. stopped, a part of the personnel coming back to the company. In this starting period of the institute, external contacts were developed and the access to foreign laboratories was facilitated, with a significant success in coordinating the MEMSWAVE European project, later (2002) nominated for the Descartes prize, which is annually awarded to the best research project developed through European collaboration. **In the period 2000 – 2003**, IMT extended its activity at national level, first by projects in the "micro-nano" field from the revised ORIZONT 2000 programme and later on (starting 2001) by consortia developing projects financed by MATNANTECH programme (New Materials, Micro and Nanotechnologies). IMT coordinated several networks financed by this programme. The multidisciplinary character of the activity was strengthened and the activities in nanotechnologies and micro-nanotechnologies areas intensified, starting projects in collaboration with industry, including the cooperation with Samsung Company (South Korea).

In the period **starting 2004**, **the investments increased**, especially from contracts funding (in 2006 and 2007 significant investments came from budgetary funds). In 2005, the first clean room at international standards was set up and a second clean room was made available in 2006. 12 infrastructure projects were developed at IMT, 4 of them funded by CEEX Programme for Research of excellence / module IV (started in 2006) and 8 projects financed by "Capacities" programme, National Plan II (started in 2007).

In this period, the ***European cooperation*** was intensified. Starting February 2004, the European Commissioner for Research Philippe Bousquin declared after a visit at IMT that this institute is a "*pioneer of integration in ERA of the Eastern Europe*". In 2005-2006, IMT was involved in 15 various European projects. In 2009, IMT was involved in 6 FP7 projects and other European projects (ENIAC, Leonardo, EUREKA, MNT ERA-NET), not to mention the bilateral cooperation. Remarkable is the financing by the European Commission of the Centre of Excellence for "RF and opto MEMS" in IMT (MIMOMEMS project, financed by REGPOT programme for EU countries).

The ***research thematic area*** had an evolution well adapted to the international dynamics of the domain. In the new national and international projects, new research areas and subdivisions were approached, especially for integration of micro-nano-info and micro-nano-bio, but also technologies for alternative energy and for improvement of the living environment. In accordance with the strategy adopted in February 2008, the themes approached in the current projects address integrated/convergent technologies, already covering some part of the strategic directions mentioned at that time.

The failure (just below the threshold) of the project to be financed from structural funds, in March 2008 (POS-CCE-Operation 221) (proposal for the set up of a centre for technologies integration - CINTTECH) disrupted only at the level of a "secondary scenario" the approach of the proposed thematic. Therefore, *the recent technological investments and fittings already permit the interdisciplinary approach of convergence themes* such as: biosensors with carbon nanotubes and systems for nucleic acids detection, biochips for biological analyses, microgrippers for MEMS, methods for handling and detection of nucleic acids, etc. A second group of recent studies and developments – also according to CINTTECH thematic – is related to *new materials and processes based applications* (such as: sensors on diamond and silicon carbide substrate, devices in GHz domain on modern wide band gap substrates (GaN, AlN), nanocomposites for fuel cells, soft lithography technologies for micro-nanophotonics, substrates for transparent electronics, alternative materials for photovoltaic cells).

All these topics announce the initiation of development and growth in the domain of proposed convergent technologies, as well as the need to address these technologies in terms of materials-processes-products. In the evolution of scientific and technological research at international level, the orientation is shaping in the direction of exploiting the *special properties* of some materials processed and structured at *the nanoscale*. Recent market researches confirm the focus on this scientific area and the level of experience and endowments of the institute allow the passage to this level of interest.

Another characteristic feature of this period is the development of ***technology transfer and innovation infrastructures*** with a *Centre for Technology Transfer in micro-engineering* (CTT-Baneasa) accredited in 2005 and a *Science and Technology Park for micro- and nanotechnologies* (MINATECH-RO), launched in June 2006. The park was

organized in collaboration with University "Politehnica" of Bucharest (the major part of the activity is however developed in IMT).

At the end of 2007, steps were taken concerning the reaccreditation of the institute, based on the new legislation. The self-evaluation report was validated to a large extent by the evaluation commission. The figures show a substantial overcome of the standards necessary for accreditation. The institute was reaccredited in 2008.

3. Situation at European level and national level

The investments in MINATECH-RO Park allowed the inauguration of a first "clean room" in June 2006, the set up and putting into operation of new equipments and offering working spaces to some companies, including in the technological area. The Centre for Technology Transfer in micro-engineering (CTT-Baneasa) from IMT attracted into **a network** over 60 **users and suppliers** of knowledge, technologies and products in the domain. The institute is also involved in many activities of European cooperation, in some cases playing a special role in bilateral collaborations between countries (example: the contacts with networks from Germany). In the same period, IMT was involved in the European system of services EUROPRACTICE, as partner in the "INTEGRAMplus" FP6 Integrated Project, in a consortium with the most important European actors in the domain. In order to become an important actor at European level, **IMT needed competitive facilities** (world class equipments and services).

This objective was largely achieved through **an investment programme** that has accumulated in the period 2006-2009 endowments of about **7 million euro for equipments**, not mentioning here the costs for the clean room infrastructure. The funds were provided, apart of the endowments from budgetary funds (2006, 2007) and of the independent endowments (from research contracts), by a number of 12 infrastructure projects (2006-2009) developing on three categories of equipments: for micro- and nanomanufacturing; characterization at micro- and nano scale; computer aided design and simulation. Starting 2007, IMT benefits from facilities for lithography covering a wide range of dimensions, at micro and nano scale. In 2008, a new clean room (class 1000) was finished, where all the equipments requiring advanced cleaning conditions were moved and also a "grey area" (class 100.000, lower-grade of cleaning), where supplementary equipments for structuring and characterziation at micro and nano scale were installed.

The recent investments in state-of-the-art infrastructure and equipments began to prove the effectiveness. Thus, the number of contacts with national and international industrial partners is increasing, especially resulting in cooperation and service contracts.

4. **Strategic objectives of the institute in the period** 2009 -2015

Redefining IMT mission: on medium and long term, the institute intends to consolidate its role of **technological pole in the domain of micro-nanotechnologies and convergent technologies**, assuring a concentration of the research efforts at national level, but also a direct and efficient interaction with the training activities and valorisation of research. IMT also intends to play a role at regional level and be a part of the system of technological centres at European level.

The strategic objectives of the institute on medium term (representing just parts of the IMT "mission") have not unchanged (since September 2009):

a. The institute intends to become a **centre of excellence** in research and development related to the **integration/convergence of technologies** (micro-nano-biotechnologies) and their applications in various domains. Emphasis will be put on the study and implementation of technologies for the obtaining, processing and integration in advanced systems of various nanomaterials and nanostructures with special properties (nanotubes, graphene, silicon carbide, nanowires, nanocrystalline diamond).
b. The institute intends to function as a "***technological pole***", which, with its "clean room" facilities and the equipments and computational techniques, will assure a **platform for interaction of the Romanian research in the domain with the industry and the academic environment**. Through the activities carried out so far, IMT has a unique position at national level; these activities will be developed and strengthened. ***The main instrument is the Centre for Micro- and Nanofabrication IMT-MINAFAB***, which offers a wide range of facilities, not only for the real manufacturing.
c. Related to the technology transfer and innovation, in order to increase the degree of application of research results, **the institute will form a "cluster" of organisations oriented towards technological development and commercialization of activities**. The main instrument will be the Science and Technology Park, and the Centre for Technology Transfer will assure services in the park, including brokerage activities. Pragmatic but well organized procedures will be used in order to identify the technological needs of internal and external beneficiaries and to allocate the internal resources to attract the beneficiaries into collaboration and delivery of technological services. An extremely important direction of IMT activity should be patenting (including abroad) and exploitation of patents in cooperation with industry.

5. SWOT analysis

This analysis aims to emphasize the feasibility of IMT strategic objectives. IMT strengths and weaknesses and also the opportunities and threats in the national and European context are evidenced. *The analysis was carefully revised, taking into account the situation from September 2009.*

Strengths (S)	**Weaknesses** (W)
❖ The human and material potential around multidisciplinary, advanced research activities (R&D laboratories – excellence centres in FP6 networks of excellence, a centre of excellence financed in FP7 and located at IMT). ❖ Endowments of 7 million euro in state-of-the-art equipments (2006-2009), representing an advanced experimental basis. ❖ The existence and successive development of a system of facilities like "clean room", essential for the activity domain, with unique equipments and human resources, where other researchers outside IMT, PhD students, specialists from companies have access to	❖ Insufficient human resources, especially compared to the new equipments to be installed or purchased, as well as compared to the vast multidisciplinary thematic area. ❖ The "geographical" distance from the university (UPB) which IMT has the most frequent collaborations with, and in general the distance from the academic environment

❖ The existent potential for offering a complex variety of scientific, technological and training services (including training by research and training for technological activities and computer aided design / simulation), materialized in IMT-MINAFAB centre, under development. ❖ A favourable "geographical" position, on an industrial platform, between two airports, in an area which is rapidly expanding (including the business area). ❖ The existence in the institute of infrastructures for innovation and technological transfer, which facilitate the put into good use of research (including "spin-off") and the cooperation with companies involved in RDI. ❖ The existence of good collaboration between the research groups in IMT with other research units, mainly in the networks at national level, assuring a multidisciplinary research ❖ The development of European projects: a number of 15 FP6 projects and 6 FP7 projects, offering connexions and a good visibility and a special role in the domain in the Eastern Europe. ❖ Organizational culture (flexibility, communication and stimulation of researchers) ❖ The existence of a high-level infrastructure for information and communication technology	reduces the collaboration opportunities. ❖ Activity of patents publication not sufficient at national level and inexistent at international level. ❖ Small number of laboratories to be accredited. ❖ Lack of procedures for quality control (ISO). ❖ Number of ISI publications below the possibilities and unequal distributed in R&D labs. ❖ The equipments and software need major adjustments, even if they were extended during the last years ❖ The main building no longer offers a space for development and has to be consolidated for assuring total safety in case of a major earthquake.
Opportunities (O)	**Threats** (T)
❖ Redefining the research policy in Europe, with a more "aggressive" orientation towards new technological domains and intensifying the collaboration, including with the new member states ❖ Romania's integration in Europe, including the possibility to accede to structural funds for RDI infrastructure ❖ The economical and political evolution of the region (South-Eastern Europe, including Western pat of Balkans) may increase the interest for the facilities offered by IMT. ❖ The current economic crisis stimulates the reorientation of companies and investors to advanced technologies	❖ The long time necessary for new technologies to penetrate in the economic environment (innovative companies, spin-offs) may determine the lost of an opportunity. ❖ The strong concurrence at international level, including in FP7 and other European programmes. ❖ Upheaval of the strategy and plan developed for 2007-2013 (the research policy is changing).

6. Objectives resulted from SWOT analysis

General aspects. Before drawing conclusions from the above analysis, it is important to underline some general aspects related to the "assets" of an organisation in a knowledge-based economy.

A general approach suggests that the specific activities and objectives mentioned below as a result of SWOT analysis represent only a draft of a future complex plan for institutional development.

Conclusions of SWOT analysis.

The SWOT analysis related to the strategic objectives presented in section 4, offers a justification for the **objectives** below:

- increase the quality of scientific research activities and the degree of put into good use by publications (especially ISI) and also by patents and technological transfer;

- recruitment and training of permanent staff, including the participation to common activities with universities (master and doctorate degrees), as well as attracting Romanian specialists currently working abroad; the temporary personnel working on short and medium term is important also;
- concentration of research-development activities on the domain of interest at national and European level; promoting the research directions with a real chance to reach a level of excellence;
- focusing and maintaining the cooperation activities at European level, having as main target the participation to certain programmes and priorities in FP7
- establish and consolidate partnerships with important European institutes (relevant examples: substantial collaborations with LAAS/CNRS, Toulouse, France and FORTH, Heraklion, Greece – realizing a twinning in the MIMOMEMS project of centre of excellence, financed by the EU);
- consolidate the institute as a "technological pole" with national role (regional role is preferred also), grouping various resources related to micro-nanomanufacturing, characterization, design and simulation; this will be realized especially trough the development of the centre for complex services IMT-MINAFAB (IMT centre for MIcro and NAnoFABrication)
- consolidate the national networks with IMT as contact point, especially on the direction of interaction with the European technology platforms for nanoelectronics, nanomedicine and photonics; maintenance of activities after the end of financing for CEEX networks (2008);
- reconstruct the partnership with the Faculty of Electronics from Univ. "Politehnica" of Bucharest, especially by IMT contribution to the offer for "micro- and nanotechnologies" master degree; initiation and development of partnerships with other faculties; involvement of master or PhD students in the research activities at IMT
- increase the critical mass of the offer for knowledge, technologies and products in the domain, by (a) activity of the "valorisation group" in IMT ("bottom-up" initiative); (b) developing the network of the centre for technological transfer in micro-engineering (CTT-Baneasa), including users and suppliers of knowledge and technologies;
- promote the "spin-off" activities at the institute level, but also at the level of universities IMT collaborates with;
- complement the technological equipments and increase the degree of use by a technological order which will assure in the same time the versatility of using these equipments;
- development of marketing activities to promote technological results and services for innovation-oriented firms
- complement the characterization equipments and gradually accrediting the respective laboratories;
- structuring and diversifying the services offered by the institute, complementally to the ones available at European level;
- developing collaborations with companies manufacturing equipments in the domain;
- complement the investments in equipments and tools, to enhance research in areas recently addressed by the collaboration with companies and educational activities; IMT put forward a new project for infrastructure at the call for proposals POS-CCE 2009,

focusing on materials with special properties and obtaining integrated micro-nanosystems.

- participating to the effort for regional development (Bucharest-Ilfov development region) with projects financed by the programmes for structural funds and inter-regional projects (cross-border).

7.a Scientific policies: Research areas.

THE DOMAIN OF INTEREST FOR THE INSTITUTE (a "map" of the domains of interest for the current moment and predictable future)

The current and future research directions of the institute are the following:

Development of nanoeletronics, photonic and microwave components

- Developing new techniques for micro/nanofabrication of components and microsystems using silicon technology and wide band gap semiconductors (GaN, AlN), as well as dielectric materials, polymers, carbon-based materials, ceramics and piezoelectric materials.
- Development of new techniques for design/simulation and characterization of materials, micro/nano-structures and systems.
- New concepts and structures of devices (nano-electronics, photonics, microwave) and Microsystems (Optical MEMS, RF-MEMS)

Advanced materials

- New *nanostructured materials* (semiconductors, organic, hybrid - organic / inorganic) *with controllable properties, new functionalities* and improved performance, without a negative impact on health and environment.
- Obtaining and processing materials with special electronic, mechanical and thermal properties, used as substrates for advanced micro-nanosystems. Focus on graphene, silicon carbide, nanocrystalline diamond.
- Advanced materials and biomaterials for the improvement of the quality of life: nanomaterials, biomaterials and hybrid materials.
- Micro and nanocomposites for constructions, industrial applications, transport.
- Development of *advanced techniques for nanomaterials and nanostructures characterization.*

Development of new technologies

- Development of new conventional and unconventional technologies for fabrication (including "soft lithography", replication technologies) to obtain cheap products in large quantities.
- Technologies for structuring and integration of carbon-based materials
- Micro-and nanomechanics, unconventional technologies in high precision mechanics.
- Development of technologies for the heterogeneous integration of microstructures and systems and assembly/micro-assembly techniques, quick assembly

Integration and convergence of technologies

- Integration of micro-and nanotechnologies and development of a set of mixed technologies (example: microfluidics/ICT/micro-nano, bio/ICT/micro-nano, chemo-bio/ICT/micro-nano, RF MEMS/NEMS)
- Nano-bio-technologies: study of nano-bio interaction; combining nano-chemistry with nano-biology, microfluidics, with the aim to obtain biosensors and biochips

Development of applications (for components, micro/nanosystems, materials and developed technologies)

- Application of nanostructured materials and nanotechnologies **in traditional industries** and constructions in order to improve product quality and functionality
- Energy conversion systems at the nanoscale
- Transducers, sensors, microgrippers based on new materials and technologies
- Integration of smart micro/nano systems (sensors, actuators, control systems, mechanical structures) and development of **industrial applications, as well as applications in transport**
- Micro/nanostructures and systems for **communications**
- Micro-nanosystems for **biomedical applications** (prevention, diagnostic and treatment)
- Sensors and micro/nanosystems for environmental and food quality monitoring

STRATEGIC ORIENTATION

The characteristic of the period 2007-2008 during the development of the institute was the rapid improvement of the infrastructure (especially through CEEX programmes and "Capacities" / PN II). Essential is the fact that the Strategy for RDI and PN II (National Plan) provides a predictable framework for the evolution of the institute on medium term (2007-2013). Moreover, there is the possibility to participate in the POS-CCE call for proposals (structural funds) with a project proposal for a large investment.

This circumstance determined a re-grouping of the topics of interest, as shown below. Please note that it is only a re-grouping and detailed description and not a change in the directions mentioned above. The research area will be focused on two main directions, corresponding to the research priorities in Romania.

A first major direction (A) is related to Information and Communication Technology (Information Society Technologies), priority 1 of PN II, research area 1.7 (nanoelectronics, photonics, micro-and nanosystems). The "micro-nano" theme in PN II is closely correlated with corresponding theme/priority 3 (ICT) in FP7. In this direction, IMT has reached a certain level of maturity and performance, confirmed recently by winning the MIMOMES project, which finances an European centre of excellence in "*RF and opto MEMS*". The evolution of the centre corresponds to the topic in the previous version of the strategy, ICT domain.

A second major direction (B), which will correspond to *an important extension of IMT activity* may be related to the priority "Materials, processes and innovative products" in PN II, in the broader context created by the theme/priority 4 (NMP) in FP7. In the frame of "materials, processes and innovative products" priority, the products and technologies are addressed mainly to industries, but also to the areas (priorities): health, environment, agriculture, food safety and security (as in FP7).

The CINTTECH project played an exceptional role, even if it was not funded (just at the limit). First, **the reorientation of topics** was the basis for: (a) new proposals in 2008 PNCDI competition - many of them accepted for funding, (b) the new core program of the institute, CONVERT (2009-2011), based on the idea of convergence of technologies. Secondly, **the concept of organizing the R&D activities** (see below) was also implemented in the meantime, in good measure. Finally, **the destination of experimental facilities** put into operation in 2008-2009 is in accordance to the CINTTECH objectives.

Observing the already structured effects of CINTTECH project, and based on a pragmatic analysis of the context and cash flow, the IMT approach for the call for proposals on infrastructures launched by the structural funds programme POS-CCE in 2009 addressed a specialization in an area of great scientific and technological potential. **The focus will be on the class of carbon based materials, according to recent forecasts of scientific and technological development, and in the context of current orientation towards technology integration.**

The new research centre to be created is called the **Research Centre for Integrated Systems Nanotechnologies and Carbon Based Nanomaterials, acronym: CENASIC.**

The role of CENASIC project is to coagulate the already existing interest and experience in some laboratories in the domain of using carbon nanomaterials with special properties for the development of integrated micro-and nanosystems, with applications in various economic sectors. The proposed directions are new research directions for IMT:

D1 – Processes for *silicon carbide* based micro- and nanostructures

D2 – Technologies for *graphene* and hybrid micro- and nano-electromechanical systems

D3 – Technologies for *nanocrystalline diamond* and applications in MEMS/NEMS and precision mechanics

Complete technological flows for each of the 3 proposed materials will be developed, using equipments for thermal processes and ultravacuum depositions for material synthesis, dry etching equipments for advanced processing and characterization and testing equipments for checking and optimizing the developed systems.

The essential elements of the centre are the following:

- orientation to applications and collaboration with industry
- complement the existing infrastructure: complementary extension of the clean room and the area for gaseous precursors processes
- providing certain conditions - complete technological flow, space for offices - to initiate collaborations with industrial partners interested in technology transfer and young people interested to attend courses and training sessions (the "internship" concept)

The proposed site for this centre is the damaged, dismantled and unused part of the technological area, with 200 sqm surface. To ensure the achievement of the proposed objectives, a clean room will be designed at the ground floor and 2 floors will be available for laboratories and offices for the temporary and permanent personnel.

7.b Scientific policies: organizing the R&D activities

The ambitious concept of CINTTECH project has been extremely useful for **rethinking the R&D activities in IMT**, which meanwhile got an unprecedented degree of complexity.

This concept of organization is taken from the 2008 version of the strategy (experimental laboratories, technological platforms, clusters of projects). **It is not reproduced here.**

7.c Scientific policies: organizing the services activities

A great flexibility and efficiency of the operating system is ensured in the cooperation between researchers and groups, as well as in using the research infrastructure. Still, the organization of services for the external environment is necessary, services offered to people not involved in the research activities at the institute and who simply require direct or indirect access to processes and equipments available at the institute. In the USA, networks of technology centres are funded (through the "National Nanotechnology Initiative", launched in 2000 and updated in 2007), which provide direct access to the equipments for researchers (from another centre or outside), PhD students and industrial companies. The interaction with industry is on a commercial basis (training and access are available after payment), without imposing any other conditions.

In Europe, the “Capacities” programme in FP7 finance projects of “research infrastructures”. IMT participated as partner in such a project proposal (acronym FINE): a “flexible” network of infrastructures (facilities for micro-nano) assuring transnational access of researchers, with the condition to publish their results. To manage this access, the institute set up IMT-MINAFAB (Support centre for MIcro- and NAnoFABrication), in the frame of the new organizational structure. Even if the FINE project was not financed, it was extremely important for IMT, which later on set up IMT-MINAFAB.

However, IMT cannot be limited to offer access only to publicly funded researchers, but has to provide access also to companies (and is actually doing this, through the Science and technology park for micro-and nanotechnologies MINATECH-RO). A typical example is the American company Honeywell in Romania, which signed an agreement of cooperation with IMT in September 2009.

7.d The new organizational structure of IMT

The organizational structure approved in the meantime (May 2008), after the previous version of the strategy was transmitted to the National Authority for Scientific Research (February 2008), provides a separation of the R&D and “technical” activities (essentially the ones in the technological area) from the other categories of activities:

- IMT-MINAFAB
- CTT-Baneasa
- Education
- International cooperation

This new organizational chart facilitates the implementation of the strategy.

8. Personnel policies

In terms of *attracting new human resources*, IMT has acted and will act in the following directions:

a) Training and specialization of young people by research in top fields at international level, providing access to young students, master graduates and PhD students at IMT infrastructure: "clean room", software for advanced design of micro and nanosystems, state-of-the-art equipments for characterization and nanolithography. IMT will closely collaborate with the Faculty of Electronics at the University “Politehnica” of Bucharest for providing courses and hands-on training for master degree in micro-and nanotechnologies.

b) Attracting young people to work at IMT, by involving them in national and international contracts, giving them incentives, especially for the area with new equipments, where there is an urgent need of manpower.

c) Further involvement in projects financed by the Marie - Curie programme (and other equivalent programs), offering possibilities for young people from European countries to work in IMT.

d) The Institute will consider temporary employment of other foreign specialists.

e) The activities of multidisciplinary training and attracting R&D personnel will be addressed also to specialists with a long experience (of different generations).

f) A special attention will be reserved for attracting and training the personnel involved in scientific and technological services.

Regarding *the policy for motivating the R&D personnel*, two aspects should be taken into account.

First, *the autonomy* of researches will be maintained in general and especially the autonomy of project managers. The researchers may professionally re-orientate, they could benefit from courses and training sessions abroad, could submit project proposals and coordinate projects. The managing board of the institute will promote professional performance criteria required to accede to higher levels of compensation, in accordance to the performance evaluated at organization level and using the regulations related to the institute reaccreditation.

Secondly, the project coordinators (IMT coordinator or unique executor) and the persons in charge of a project (IMT partner in consortia) will have a *higher responsibility* for managing IMT participation in various contracts, assuring: (a) complete use of IMT potential, including the synergy with other projects; (b) scientific originality of results and valorisation potential (by innovation); (c) efficient management of funds and increase of tangible and intangible assets of the institute (including the development of “technological platforms”, by integrating materials, processes, technologies).

The responsibility at the level of new organizational forms (clusters, experimental laboratories) is briefly presented below.

The clusters’ activity will be done mostly by self-organization, in the limits of a general orientation (policies) at the institute level. A collective management board will be formed by representatives of all R&D laboratories, research groups, etc.

The experimental laboratories will have an autonomy degree, in the limits of general rules established at the institute level, starting from assuring a high-level standard

of exploitation, obligation to ensure the direct or indirect access of R&D groups, support of the institute assured by the “support centres”, training and recruiting of personnel, etc.

9. Investments policy

The investments policy is an essential part of the strategy, considering that IMT is a technology institute acting in a top domain of activity. A characteristic of the domain is the necessity to operate in extreme cleaning conditions (clean room), for the actual “manufacturing” part. Other equipments need special conditions for functioning as well. A specific “micro-nano” facility needs not only large investments (equipments, fittings), but the costs of operation are really high. The infrastructure has significantly improved during the last years, by purchasing key equipments, but the policy for purchasing new equipments should continue, in order to ensure competitive facilities, in accordance to IMT mission.

It is necessary to correlate the investments policy with the policy for research, personnel, etc. Although the main activity of IMT is R&D type, the institute must provide access to facilities for education / training by research and innovation process (cooperation with companies).

The current buildings of IMT are not satisfactory, for the following reasons:

(a) The main building (offices building) is already saturated with activities, not allowing the installation of new laboratories and access of a larger number of collaborators from outside (from partner institutions); moreover - the building has to be renovated and consolidated.

(b) The technological area has a sufficient surface (1800 sqm), but is only partially designed to international standards.

The investments policy (buildings and equipments) should consider the following:

1) The institute focus is on micro- and nanotechnology, with micro- and nanofabrication (of structures, devices, subsystems and systems) as a distinctive feature, unique at national level.

2) Ensure all key equipments along the whole chain of obtaining potential products: design - fabrication (including lithography / masks) - characterization. The research in materials domain (especially for developing new devices and technology integration) and the technological processes require various characterization equipments. Specialized equipments are also needed for the functional characterization of the potential products and their reliability testing.

3) Development of "technology platforms" for "technology integration" (see section 7) by R&D activities requires a versatile organization, assuring access to resources by specially designed "support centres".

4) Acquisition of equipments with capabilities at worldwide level (resolution, accuracy, versatility, data processing, etc.).

5) Ensure optimal operating conditions of equipments (fluids, cleaning, mechanical stability).

6) Organization of spaces and exploitation of facilities in order to allow the access of researchers, students (master, PhD), companies.

7) A new building for the institute: new laboratories and spaces for new research groups in IMT and outside (working points).

8) Security of energy, limit the growth of electricity consumption.

9) Security of buildings and especially of technological areas.

10. Management policy

The management policy has continued since the institute was set up (1993, since 1996 - national institute) until now. In the recent years it has been **reconsidered and confirmed in terms of knowledge-based economy**. The management policy will be very briefly presented below, without further explanations.

The following aspects are representative for the institute:

- ***Human resources - a priority***. Stimulation of human resources, including the financial stimulation, was the key to institute development;
- Know-how specific to high-resolution technologies (clean room), provided by re-grouping of specialists from various units from Baneasa platform (in terms of a long-term "*brain-drain*");
- The organizational culture based on collaboration, researchers' initiative, transparency, communication;
- Network of partners and users created by numerous research or "infrastructure" projects (scientific or technological networks).

11. Financial policies.

By July 2009, the institute has regularly paid the debts to the state and managed to ensure a certain stability of the payments, despite funding problems from the national programmes (reduced pre-financing, of only 30%, some late payments). The economic and financial activity is very complex, due to the diversity of activity, management of numerous projects (including EU funds), intensification of acquisitions and investments. Additional staff was hired at the institute and specialized software was purchased.

Problems related to the low level of research funding in 2009, below expectations, were added.

In 2008, a contract for a credit line was signed with the aim to counteract, at least in part, the difficulties related to the extremely low level of pre-financing. Unfortunately, the bank failed to honour its obligations for activating the credit line (July-August 2009).

The centralization of acquisitions at the institute level by an "acquisitions' plan" (in accordance with the legislation) allowed rationalization and planning of expenditures made from various contracts.

Note:

This document has a number of Annexes, not reproduced in this English version.