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# 1 – Introduction

During its lifetime, the Polytechnic Institute of Coimbra[1] (IPC) has developed into a culturally diverse institution, comprising six separate Schools, all working towards achieving the same goals.

Throughout its history, the IPC has predominantly taught shorter courses and has passed many students from secondary school level and upwards through its doors. Its body of teachers, including doctorate level professors has increased and its research capacity is such that it is now possible for the IPC to establish and prove its positioning in the international academic community.

This report presents the Institute's global vision. It also contains information about the different Schools within the IPC (Annex 2), about legislation relevant to the sector as well as a number of documents important for clarifying the IPC's standing (Annex 3).

There is a specific chapter dedicated to the Student Services (SS) of the IPC, as these activities are considered a crucial part of the application presented to the European University Association (EUA).

This self-evaluation report also presents some of the IPC's strategic and tactical positions, some of which could be seen to be outside of the IPC's remit. However, this approach is unavoidable due to the presence of higher education policies and legislation developed by recent governments, which continue to impose a dual higher education system that will be explained more fully in this report.

This report presents the goals and objectives with regards the changes and developments envisaged for the IPC in various areas, including: the consolidation of the appropriate training programmes offered at under-graduate and post-graduate levels; an increase and internationalisation of R&D, staff and student mobility and partnerships with national and international businesses and organizations; process reviews and course certification in accordance with internationally-recognised organisation and management models and quality management systems.

# 2 – National and Institutional Context

## 2.1 – The structure of the Portuguese Higher Education System

The IPC is a State Higher Education Polytechnic, supervised by the Ministry of Science, Technology and Higher Education (MCTES).

In the Portuguese law that establishes the national education system (Law nº 46/86), it states that the higher education system "comprises university education and polytechnic education".

- "University education aims to ensure a solid scientific and cultural preparation in order to give graduates the technical training which will enable them to develop professional and cultural activities and promote the development of creativity, innovation and critical analysis skills". The Portuguese University Board of Deans (CRUP) is the entity that groups the Deans of the different Portuguese Universities.
- "Polytechnic education aims to give a solid technical and cultural training at a higher level, developing innovation and critical analysis skills as well as teaching

[1] Instituto Politécnico de Coimbra (IPC)

> theoretical and practical scientific knowledge and its application in the labour market". Therefore, the philosophy of polytechnic education is professionalization and practical application. The research developed in this ambit is much more practical and concerned with experimental development, taking into account the different needs in technological, educational and service sectors, especially in a regional context.

The entity that unites the Presidents of the Polytechnic Institutes is the Coordinating Board of Higher Polytechnic Institutes (CCISP). In accordance with Law 74/2006, Polytechnic Higher Education Institutions are able to award *Licenciado* degrees and Masters degrees and University Higher Education Institutions can award *Licenciado*, Masters and Doctorate degrees.

It is worth noting that in Portugal there has long been a distinction between two higher education bachelor degree-level diplomas: the *Bacharelato*, which is a professionalizing diploma conceded by Polytechnics, and the *Licenciatura*, which is a more theoretical diploma conceded by Universities. Until recently, the former was still considered an undergraduate degree. But as the Bologna Agreement is implemented, both these degrees will become Level 1 degrees, whilst maintaining their original more professionalizing or more theoretical orientation.

## 2.2 – Introduction to the IPC

### 2.2.1 – Historical Perspective

The IPC was created in 1979, in the context of the implementation of the *Polytechnic Higher Education System* (PES) in Portugal. However, its effective existence would only commence in 1988 with the nomination of the first president of the Implementing Commission.

In 1995, the Statute of the IPC was approved by a board of professors, students and staff and in July 1996, the first president entered into office. During the period of the implementation of the national education system, the Polytechnics only had the right to award a *bacharelato* diploma to their students. It was only with the introduction of the Higher Education Specialized Courses that graduates could leave the polytechnic with a degree-level qualification, the Specialized Higher Education Diploma.

However, even before the implementation of the Polytechnic Educational System, there were some colleges that could legally award a PhD diploma. These included the Coimbra College of Accounting and Business Administration (ISCAC) and the Coimbra College of Engineering (ISEC).

A new phase in the development of the Polytechnic Higher Education System began with the change to the educational system legislation that introduced a two-tier degree system.[2] Without neglecting its original mission as a Polytechnic, the introduction of the new two-tier degree system gave IPC students the opportunity to access the labour market more quickly, by being awarding a *bacharelato* degree after three years of study, but also being able to receive a full Honours degree *(licenciatura*) as well as the opportunity of further study.

This new phase in the evolution of the higher education system placed the IPC in a new paradigm in which the percentage of its teaching staff studying towards and gaining a doctorate degree increased.

### 2.2.2 – Geographical Context

The IPC is situated in Coimbra, a city located in the centre of Portugal. The different Schools are spread out across the city. On the one hand this allows the IPC to be well integrated into the local community, but on the other hand it presents operational challenges and higher costs due to the dispersion of its administrative structures. One of its Schools is located in a different city altogether, in Oliveira do Hospital.

Coimbra is a historical city and capital of the Central Coastal Region of Portugal. This district includes 17 councils: Arganil, Cantanhede, Coimbra, Condeixa-a-Nova, Figueira da Foz,

[2] I.e. two level degree = 3 years of bacharelato degree + 1 year of specialization = Licenciatura (graduate level degree).

Góis, Lousã, Mira, Miranda do Corvo, Montemor-o-Velho, Oliveira do Hospital, Pampilhosa da Serra, Penacova, Penela, Soure, Tábua e Vila Nova de Poiares. Together they form an area 3,947 kilometres squared, the 12th largest district in Portugal. According to the 2001 Census, the district has approximately 441,204 inhabitants (an increase of 4% over the last decade). The Municipality of Coimbra comprises 31 parishes and covers an area of 319,4 km2. It has 148,443 inhabitants (in 2001), which gives it a population density of 445,8 inhabitants per km2.

The local economy is strongly tercialized, with a strong emphasis on tourism, thanks to its rich historical patrimony dating back to the Roman times. Secondary sector economic activities can also be found in this region, whereas the primary sector is almost non-existent.

Health and education are the largest of the local public services, and there is a wide network of such institutions. At the higher education level, there are The University of Coimbra and the Polytechnic Institute of Coimbra. The city owes much to these higher education institutions that are at the forefront of scientific research, especially in the areas of health and technological innovation. Coimbra has excellent transport links; by road to the Northern motorway (the A1, the A14 and the A31); by train (the Coimbra-B train station); by air (*Aerodromo Municipal Bissaya Barreto Coimbra*); and by sea (via the nearest port at Figueira da Foz).

Oliveira do Hospital is a city in the District of Coimbra, which is part of the Interior Central Region of Portugal. It is the local hub and covers an area of 234,55 km2 with 22,112 inhabitants (2001). It is divided into 21 parishes and has a population density of 95 inhabitants per km2. In the last ten years, this area registered a 3% decrease in population. The primary sector is small, it makes up 8% of the local economy, which is a higher percentage that that of the population that it employs. The secondary sector employs approximately half the local population and 34.4% of local businesses are engaged in this sector. More specifically they can be broken down into food businesses (dairy produce, meat processing and in particular cheese and local food specialty production), metalwork, textiles and wood. The tertiary sector, however, is the one that dominates the local economy, with approximately 57.6% of local businesses engaged in this sector, and in particular the following sub-sectors: wholesale trading, hoteliery and catering.

There is a local network of public services, in particular education and health. At the higher education level, there is one of the IPC's Schools – the Higher School of Technology and Business Administration in Oliveira do Hospital. In terms of accessibility, there is the EN17, which connects to the IP3 (towards Viseu and Coimbra) and to the IP5 (towards cities such as Aveira, Seia, Guarda and then Spain).

## 2.2.3 – Brief Introduction to the Schools and Research Units

The IPC is made up of seven Schools (including the Student Services) and its Central Administration Services:

- **The Coimbra School of Agriculture** (ESAC) is over a hundred years old and nowadays is undoubtedly at the forefront in the area agricultural science at the national level. Therefore it usually attracts the vast majority of high school students interested in this scientific area. It was only integrated into the IPC in 1985. Today, it offers degree courses in Agrarian Science, Food and Environmental Sciences, Ecotourism and Biotechnology. The ESAC is proud of its history, which gives it the necessary strength and motivation to adapt to the new technologies and to the changes in the sectors it specialises in. The ESAC has modern facilities, including excellent equipment and laboratories as well as huge forested and agricultural areas, which allow it to be one of the top national institutions in agricultural training and research.
- **The Coimbra School of Education** (ESEC) is also a hundred years old. In the past it has taught a variety of programmes, not all related to Education. For this reason it describes itself as a "multiple school of multiple choices". The ESEC was created and integrated into the IPC in 1979. It began teaching courses in Pre-school Education and Portuguese, French and Musical Education in 1987. Nowadays, the ESEC offers training beyond the education field, namely in

Communication, Tourism, Socio-Educational Animation, Multimedia, Arts, Sign Language and Sports.

- **The Oliveira do Hospital School of Technology and Management** (ESTGOH) is the youngest School in the IPC. It is of great importance to the development of the region which links Arganil to Oliveira do Hospital. The ESTGOH teaches management studies and its aim is to train suitable professionals for the country's and the region's economic fabric. It started teaching in the school year 2001/2002 and is gradually building on the content, structure and teaching methodology of its courses in order to build a firm reputation with regards the quality of its teaching staff and sharing of knowledge. In this way, this School aims to contribute to the development of the Beira Serra region and the country as a whole, as well as becoming a first choice amongst future students.
- **The Coimbra School of Health Technology** (ESTeSC) is a very young faculty. ESTeSC was integrated into the IPC in July 2004; as such it is the IPC's most recent addition. It has been a part of the National Educational System at the polytechnic education level, since December 1993. Founded 40 years ago, it has changed its name three times: in 1961 was called the Centre of Training for Technicians and Auxiliaries of Clinical Services; in 1980 it became the Coimbra Centre of Training for Auxiliary Technicians of Complement Diagnostic Services; and finally in 1982 it because the Coimbra Technical School of Health. Nowadays, ESTeSC offers seven two-tier degrees all in the field of health studies.
- **The Coimbra School of Accounting and Business Administration** (ISCAC) has a common history with the Coimbra School of Engineering and is one of the leading accountancy colleges in the country. With its roots in the Coimbra Institute of Commerce and Industry (which itself turned into the Commercial Institute), ISCAC was created in 1976 and joined the IPC in March 1988. It teaches courses in management and business studies, it regards itself as a school-business, as it focuses heavily on practical teaching and apprenticeships directed towards the increasingly competitive labour market. An example of its strategy towards effectively fitting its students into the labour market, is the introduction of night classes so that students can study whilst continuing to work, and offering Masters courses (in the pre-Bologna period) in cooperation with other Portuguese higher education institutions, thus ensuring the continuing academic development of its graduates.
- **The Coimbra School of Engineering** (ISEC) has a similar historical path to the ISCAC, having been the Industrial part of the Coimbra Institute of Commerce and Industry. It joined the IPC in 1988 and as well as delivering strong and professional courses in its area, the ISEC continues to respond to the labour market's needs and to the continuous development of the industry and its corresponding technological evolution. It aims to fulfil its graduates' expectations of preparing them for the job market and as a result the rate of graduates straight into work after graduating from this School is high.

- **Student Services** (SS), created in 1996, has its own legal personality and has administrative and financial autonomy and as such is considered to be a unit as important as the different Schools that make up the IPC. The regulations governing the Service were published in June 1997 and its staff list was put together in August of the same year. Student Services aims to offer IPC students improved study conditions and the necessary support to enable them to be well integrated into the academic community and to lead a stable college life. By offering this support to all students, Student Services promotes equal opportunities of school success. It offers support in the form of direct assistance (educational grants) or indirect assistance (food and accommodation) and services (health, cultural and sporting activities). All grants are annually conceded by the State and are aimed at students with more modest economic means. They come in the form of instalments and normally sufficient to cover a student's costs of undertaking higher education (including accommodation, food, transport, books).
- **The Central Support Services** (CSS) are the technical and administrative IPC support units and they form a link between the different Schools that make up the IPC, the teaching units and the wider society. The CSS's activities revolve around

the administrative, financial, human resource, communications (internal, external, national and international), technical and juridical support activities of the IPC.

- **The Research Centre on Natural Resources, Environment and Society** (CERNAS) was created to research and disseminate new scientific knowledge through the formulation and implementation of research programmes and quality training in the relationship between society, natural resources and the environmental as well as the impact of environmental planning and management on sustainability and development. CERNAS was created in July 2002 and is accredited by the Foundation for Science and Technology (FCT) and is subject to international evaluation (it most recently received a "Good" classification).

### 2.2.4 – IPC Student Profile

Students who choose the IPC want to receive an education which includes a strong practical element and which supports and consolidates a solid theoretical preparation. Students come from a wide age range, largely due to the fact that the IPC offers day and night classes. Many of them are looking for a second degree or training that will complement their vocational activities. The majority of IPC students come from the Central Region of Portugal. However, there are also many students from other Portuguese regions and from the other 'PALOP' countries (countries whose official language is Portuguese). More detailed information on this subject may be found in the Reports of each School (Annex 2).

### 2.2.5 – Number and Distribution of Students per School

Information on the evolution of student numbers from 2000/2001 to 2005/2006 may be found in Annex 1 (Tables 1, 2 and 3).
Over the last three years, higher education institutions nationally have felt the impact of the country's decreasing younger generation population. As a result, there has been a lower demand for courses and the IPC has had to re-think its strategies. It has promoted new measures, namely:
- The diversification of degrees offered at the different degree levels;
- A new communications strategy based on the broadcasting of IPC information in the media, participation in specialists fairs and promotional exhibitions, working more closely with secondary schools including arranging visits and open days so potential future students can get to know the college;
- Targeting potential students already in the labour market who may want to undertake new training or build on their current qualifications, by offering some courses after working hours.

These new measures have already shown some positive results. Despite the fact that some of the IPC's Schools are still reporting a lower number of students compared to previous years, on the whole the number of students enrolled in their first year for the IPC as a whole has risen drastically. The IPC hopes that this upward trend will continue as this could also help to integrate all the courses into the 'Bologna model' in the next academic year.

### 2.2.5.1 –Rates of Success and Failure by School

School Success Rates in the relevant academic years are presented in Annex 2.

### 2.2.5.2 – Job opportunities and entrepreneurship

The Polytechnic Education model in Portugal is focused on professionalism and practical educational programmes. The IPC fundamentally believes that the links with the local community are crucial in order for its students to be able to participate in apprenticeships, internships and other work-placed schemes as outlined in each course's Study Plans. This close link with the labour market is formalised by Cooperation Protocols signed by the IPC as

well as the individual Schools. As well as offering internships, these agreements also help to organize activities such as Seminars, Meetings, and Conferences and create real job opportunities for graduates as well as a link between the teaching staff and the working professionals in the different sectors. In order to strengthen job opportunities for graduates, the individual Schools have created support services and in the IPC as a whole there is the UNIVA (Unit for Integration into Working Life), which supports all IPC's students in helping to move into working life.

In terms of entrepreneurial motivation, there are an immense variety of areas, all of which are in some way related to the different academic and professional training of graduates. The entrepreneurial potential (that is the number of students who want to create their own businesses and those who remain undecided), is around 39%, being 35% for the ESAC, 32% for the ESEC, 40% for the ISCAC and 54% for the ISEC (from UNIVA / IPC data).

## 2.2.6 – Financial Resources

The IPC's financial resources come from the National Budget, from the Investment Plan for Development from the Central Administration (PIDDAC), from its own revenues and from EU funds.

The funding from the National budget is not sufficient for the IPC to be able to fulfil the targets laid down by the MCTES. The PIDDAC has been at best symbolic and at worst non-existent and has not enabled the necessary investment in crucial facilities as such: maintenance and rehabilitation works, laboratory improvements, amongst others. The progression of the National Budget between 2000 and 2006 is presented in Annex 1 (Table 4).

The funding from the National Budget is controlled and distributed by the IPC Management Board, which is composed of representatives from each School, from the SS and from the student body. In this Board, each participant is allowed to present justified suggestions on the allocation of the IPC's budget. These suggestions are analysed and discussed by all members of the Board and finally voted on (the majority vote wins). The evolution of the PIDDAC is presented in Annex 1 (Tables 5 and 6).

The IPC's own revenues come mostly from student tuition fees and donations. However, due to the lack of a culture of selling its services externally, and not registering its patents they do not account for much and are unreliable.

The Central Support Services do not keep any of this money, not even from the tuition fees. This money is spent on the CSS's initiatives such as presentations at events, making promotional materials, organising dinners and debates, sporting activities, and forging partnerships (such us with the Pedro Nunes Institute, the Coimbra Tecnopole and Regional Digital Association of Coimbra).

The EU funds come from subsidies attributed to certain projects that require advance applications to the European Commission, such as: Socrates/Erasmus, Leonardo da Vinci, Colt, Tempus, and POAC (Occupational Programme in Public Administration).

## 2.3 – SWOT Analysis

**Strengths:**
- Inclusive and participatory decision-making processes across the Schools;
- Rational dimension of each School;
- Qualification level of teaching and non-teaching staff;
- Significant increase of teaching staff working in R&D activities;
- Decentralized processes, which facilitates decision-making;
- Quality Management Service Certification of the CSS and Schools, in accordance with EN NP ISO 9001: 2000;

- Ability to develop projects with the local community;
- Development of intervention and/or research projects at national and international level;
- Investment in student, graduate and teacher mobility;
- Diversity of courses on offer;
- Availability to voluntarily undertake institutional evaluation procedures.

**Weaknesses:**
- Insufficient number of teachers;
- Absence of permanent non-teaching staff;
- Difficulties with internal communications;
- Different organisational cultures in the various Schools;
- The level of autonomy of each of the Schools is similar to the level of autonomy of the CSS (President);
- Dependency on and insufficient funding from the National Budget;
- Insufficient number of teaching staff with PhD degrees per course;
- Inadequate facilities;
- Little spread and publication of scientific material developed by IPC teaching staff;
- Difficulty of recruiting and retaining Doctorate teachers, who often prefer closer universities.

**Risks**
- Decreasing number of students applying to higher education institutions;
- Impossibility of awarding Doctorate diplomas due to legislative restrictions;
- Large budgetary and legal restrictions imposed by MCTES policies;
- Strong local and national competition between different higher education institutions;
- The University of Coimbra increasingly attracting potential IPC students by offering more professional-oriented first level education programmes;
- Higher unemployment rate;
- Increasingly demanding and ever-changing labour market;
- Proximity to other higher education institutions.

**Opportunities**

- The Bologna Agreement offers competitive advantages to the IPC, thanks to the *bacharelato* degree and its professional focus;
- Strategic localisation and interaction with public and private institutions;
- Strong community demand for the development of projects run by the IPC;
- EU funds;
- Growth of own revenues through the supply of services and projects externally;
- Invitations for IPC professors to participate in research units and associated laboratories;
- Incentives towards cooperation with other PALOP countries;
- Ability to increase own revenues.

# 3 – The IPC's Vision and Values

## 3.1 What the Institution is trying to achieve

### 3.1.1. Mission and Value

The IPC, through its Schools and in accordance with Portuguese legislation (Law nº 54/90 and Decree nº 74/2006), identifies its main goal as being the delivery of Degrees and Masters programmes, the implementation of short training courses (with accredited certificates or diplomas), the organization and cooperation in educative, cultural and technical activities and the realization of applied research work and experimental development. The IPC also aims to provide continual education and training and to support regional development.

The IPC's vision is that of an institution which, central to its mission, aims to work with the business community with a view to establishing close relationships, via the following methods: implementation of research and applied development projects, public and private partnerships, associations with not-for-profit institutions that work in R&D and that work towards regional, national and international development.

At an international level, the IPC has two focal points, one European and the other with PALOP countries. On the European level, student and teacher mobility is fundamental for the strengthening of relationships with other European higher education institutions, as well as the development of trans-national undergraduate courses. With regards working with Portuguese-speaking countries, this cooperation is done mostly via awarding degrees within the wider mission of the IPC. The research and applied development projects are considered particularly relevant.
The R&D units in the IPC are able to grow when there is sufficient human resources and laboratories to establish partnerships with universities that share common areas of interest and potential.

### 3.1.2 – Local, regional, national and international positioning

The IPC aims to become recognised as a leading national and international higher education institution. Its human resources, through its intellectual, scientific, technical and ethical potential, are considered its principal strength to achieve this objective.

At the national level, the IPC aims to keep a steady high position within the polytechnic ambit and aims to take first place in quality indicator reports. The employability of its graduates will always be one of its most privileged indicators. At the international level, namely in Europe, the IPC aims to keep, and if possible increase, the number of partnerships and exchange programmes.

At the PALOP level, the IPC aims to increase partnerships with the Universities of these countries, namely at the initial training level. Specifically in the case of Brazil it intends to implement R&D projects particularly in the area of development studies.

### 3.1.3 – Academic priorities

The IPC's academic priorities are: Training, R&D, Internationalisation, Organisation and Management, Information Systems, Communication and Image.

The IPC believes it is necessary to have a sense of balance and a certain uniformity between the different Schools and consequently to have a common strategy. Each of the Schools has a high level of autonomy, including being able to create or drop courses, as well as implement intra-School courses. Although there are opportunities for creating new courses in particular areas, there are restrictions imposed by the MCTES.

Amongst these priorities and restrictions, the most imperious is the adherence to the new regulations surrounding the Bologna Agreement, in particular with regards to the new degree courses. The new Masters programmes are immediately relevant, as these will allow the IPC to remain competitive amongst future students, the labour market and society in general.

The creation of at least two more research units supported by the FCT is another priority for the IPC and will enable it to continue to enlarge its scientific ambit and consolidate the projects considered to be fundamental to its future.

Internationalisation through European student and teacher mobility as well as cooperation with PALOP countries will be very important to the IPC in the future. In the case of Brazil, due to its increasingly developed status, the IPC aims to prioritise special R&D projects that will be of benefit to Brazilian universities and to the IPC.

The most difficult challenge the IPC faces in terms of management and organisation during its next phase is how to make the most efficient use of resources (in particular human resources) and also how to pass the quality certifications for the different Schools.

New information systems allow for some savings in resources, they can facilitate the creation of a uniform image for the whole institution and can assist in transparently sharing data (be it financial, human, research or other data).

Finally, communication and image, be it internal or external, is crucial for a more inclusive philosophy of the institution and for a stronger and more solid image of the IPC to external entities and to the wider community.

### 3.1.4 – Preferred Teaching Methods

The teaching methodologies used in the IPC are threefold: theoretical, theoretical-practical and laboratorial. Over the last few years these methods have become increasingly similar to the university teaching methods, in particular with the introduction of the two-tier degree system. Nevertheless, be it from the Bologna Agreement or be it from the self-evaluation report, there has been some space and time for reflection with regards teaching methodologies in the IPC with a view to their continual improvement.

The theoretical-practical classes, the laboratory-based classes, and more widely the tutorials, will feature more strongly in the future. This is because, in the past they have always played an important role in student life in the IPC and in the image that society has of the IPC Schools, and so are something which the IPC would like to re-capture. Now, immersed as it is in the paradigm created by the Bologna Agreement, this is a trump card which the IPC should use in order to be an institution which, being located as it is in the most famous Portuguese university town, gives it competitive advantages which put it in a leading position within a new higher education paradigm in Portugal from a European perspective.

### 3.1.5 – Centralization and Decentralization of Processes

Even though the IPC is made up of six Schools, each with a significant amount of autonomy and their own statutes, there are still some collective processes in which the IPC has no direct intervention. Processes related to institutional projects and matters as defined by regulation are centralized.

The creation of a sense of an institutional culture has been a priority for the IPC. As such, it developed a set of initiatives with all of the individual Schools. By way of example, since 2004/2005, regular meetings with the IPC's President and the Presidents of the individual Schools' Boards have been instigated. These board meetings aim to discuss issues common to all the Schools, such as recruitment, teacher training programmes, the application to public selection processes, amongst others. The proposals arising out of these meetings are presented to the Council where the IPC Management Board, which is composed of representatives from each School, from the SS and from the student body, analyses and approve them.

As it is seen to be increasingly important to have an institutional culture (be it for defending common interests, for having greater cohesion in decision-making or for other reasons), over the last few years the management board has increasingly called on the different Schools to work together on questions of common interest. As a result, working groups have been formed, which draw on the specific competencies of each of the Schools to analyse, discuss and agree various issues. For example, a working group was formed to discuss and plan the installation of a new wi-fi network across the Institution. Furthermore, an effort has been made to increase the number of courses that are taught across two or more Schools. Another example is the decision taken by the Board regarding the mobility of the teaching staff, which allows a teacher

from one School to work in one of the other Schools and in this way making full use of the IPC's teaching staff.

It is the President's decision to transfer non-teaching staff between the different Schools in agreement with existing requirements. Such transfers are possible due to the fact that the non-teaching staff form a part of the IPC body of staff and not just of the individual Schools.

There are cross-divisional projects, resulting from the participation between two or more Schools, in order to share learning between different competencies. One example is CERNAS, the research centre based in ESAC. Here teaching staff from other Schools form a part this centre in agreement with the specific requirements for each project developed in the centre.

The recruitment of teaching staff in each area cannot be surpassed by the values previously defined in any school and must take into account the funding allocated to the Schools. ESTGOH, which is a very new school, is one exception to this rule.

### 3.1.6 – Links to the business community

The relationships between the IPC and the business community are usually established through internships and the sharing of research and development activities. Although the relationships are strongest at the local level, they do also extend throughout the country and also internationally.

The individual Schools of the IPC also have their own links with the business community related to their specific areas of expertise. The following are some of the partnerships the IPC and its individual Schools are involved in: Pedro Nunes Institute; The Coimbra Technopole, the FINICIA Programme, Web in the Central Region, the Digital Coimbra Regional Association; Coimbra iPark; Lena Group; Philips Semiconductors GmbH, Germany; Oy Dorego AB, Finland, Aigaiou Archipelagos, Greece; Food Refrigeration and process Engineering Research Centre, United Kingdom, Afina Information Systems, SA, Spain, Rey Juan Carlos University, Spain; Fachochschule Jena, Germany; Studi de Torino University, Italy.

Besides these partnerships, the IPC and its Schools apply to national and international projects, alone or also in association with, for example, local enterprises.

### 3.1.7 – Links with the local community

The IPC has been looking forward to developing a strong relationship with active local groups. Its aim is to promote public discussions on themes directly linked to the development of society in general and higher education in particular. Within this scope, the IPC has promoted Dinners and Debates and fora on entrepreneurship, the PES autonomy model, new technology, the Bologna Agreement, ECTS implementation, food and environmental quality. The organization of European Weeks, integrated with mobility programmes, has also been a priority for the IPC.

The various publications, be they scientific articles, be they reports, bulletins, etc, have kept the relationship between the IPC and its publishers alive and opened the IPC up to the local community, to Europe and beyond.

In 2003 the IPC created its own periodical entitled "*Inovar para Crescer*" (Innovate to Grow), which aims to offer students a higher cultural, scientific, artistic, technological and professional awareness.

"Colectâneas de Comunicações do IPC" (Collection of IPC Communications) was created in 1999 and brings together scientific articles presented by professors in national and international conferences and seminars and demonstrates the quality of IPC publications.

### 3.1.8 – International Relations

Internationalisation is one of the most important elements to institutional IPC policy. In cooperation with the different Schools, the IPC promotes a forceful cooperation with other

foreign universities and polytechnic colleges and their students, with regards teacher mobility, research, curricula, development and education systems. Annex 1 (Graphic 1), shows the diversity of scientific areas they work together on.

The IPC has an International Relations Office as part of its Central Support Services. This has the responsibility of supervising and managing all student and teacher mobility. The IPC is currently among the top 10 Portuguese institutions for student and teacher mobility.

**Socrates/Erasmus Programme –** The IPC has bilateral agreements with 80 European universities and polytechnic institutes, enabling approximately 100 students and teachers to study and research in Europe per year. The first agreement established under the scope of Socrates/Erasmus was signed in 1989. Alongside this, the six Schools each receive the same number of Erasmus students from abroad. Participation in thematic networks, development of Curricula and Development Projects as well as European modules are several of the other activities developed by the IPC under this programme. The graphs 2, 3, 4 and 5 in Annex 1 show the development of the mobility students and teaching staff over three years.

**Leonardo Ad Vinci Programme** – The Leonardo ad Vinci programme is another European student programme that gives its beneficiaries (students and graduates) the possibility to do their training programme in enterprises or institutions in different European countries. The main goals of the Leonardo ad Vinci programme are as follows: to offer vocational training at the European level, to develop a European culture amongst recent IPC graduates, to give recent IPC graduates the possibility to develop skills which will complement their higher education degrees, to contribute to the development of socio-cultural and environmental integration capacities in different geographical contexts, to awaken and develop a taste and respect for different cultures, to improve foreign languages skills, and to amplify labour market limits.

**Prime Network –** The IPC has been a part of the PRIME network (Professional Inter-University Management Education Network) since 1999. This network consists of an independent network of European higher education institutions. Its main objective is to share common interests, develop intercultural and interdisciplinary practical projects and programmes that contribute to improvements in educational, research and applied training areas. This network also promotes educational mobility.

**PALOP Cooperation** – The IPC directly, or by means of its Schools, maintains a strong relationship with PALOP countries, namely through the establishment of different agreements with Brazil, Cape Verde, Sao Tome and Principe, Angola, Mozambique and East-Timor in different scientific areas. This cooperation is implemented by means of initial training courses and assisting student and teacher mobility.

## 3.2 – Restrictions

There are a number of internal and external conditions that place restrictions on the desired functioning of the IPC.

### 3.2.1 – Evaluation of institutional autonomy

Teaching-staff and non-teaching staff recruitment:
The hiring of teaching staff begins with a proposal presented by each School, which is then authorised by the IPC President. The recruited teachers become part of the permanent staff group of their respective Schools. The individual Schools can recruit the non-teaching staff, but they form part of the larger ICP-wide group.
The difficulties occur as a result of budget and legal limitations. There are paradoxes in the national legislation such as:
- It is legal to hire recent graduates as Coordinating Professors, as long as the School's Scientific Council requires one.
- It is legal to hire a Doctorate Professor with wide academic and professional experience as an assistant.

- The Scientific Boards suggests the recruitment of teaching staff, without having any sort of responsibility regarding the respective financial implications for the School.
The ratio of teaching staff and non-teaching staff to students is often insufficient.

Student recruitment
Degree students are recruited by two distinct processes:
- Those that are admitted via the National Admittance Exams, in which case the IPC has no involvement in candidate selection but they are the sole responsibility of the Admittance body.
- Those admitted by the Special Admittance Process, by special means, or by course or university transfer, in which the selection criteria are proposed by the Scientific Board of each School and authorised by the IPC president. In both situations, there are legal restrictions regarding the vacancies available.

Post-graduate students are admitted using selection criteria agreed by the Scientific Boards. In EU funded programmes, post-graduate courses usually have specific regulations attached.

Teaching and Apprenticeship Processes
Each college defines its own teaching and apprenticeship processes as relevant to their specific scientific areas. However, it is an important IPC goal to make teaching methodology more uniform across Schools via joint discussion. A summary of the different teaching methodologies of each School can be found in their respective School reports.

Research
As Polytechnic Education is not legally allowed to award doctorate level degrees, many polytechnic teaching staff go to other higher education Research Centres in order to gain their PhD award. The Foundation for Science and Technology (FCT) does not regard some of the IPO's training areas as eligible for creating their own Research Centres.

In the first years of its existence, the IPO's teaching staff were mostly graduates and a lot of effort was made to undertake Masters degrees, because, according to Portuguese legislation (art. 5º e 17º Decree 185/81) a professor may be hired if they have a Masters degree and three years of solid work experience. Since 1998, and the creation of the two-tier degrees, efforts are now being developed towards implementing a doctorate diploma. An important contribution to this change was the Programme of Educational Development for Portugal (PRODEP), which is due to end in December 2006.

Table 7 in Annex 1 shows the evolution of the number of doctorate professors between 2000 and 2005. It shows a clear increase in the number of doctorate professors, from 65 in 2000 to 101 in 2005. The aim is that the majority of teaching staff will have PhDs, always favouring those who can combine a strong academic background with strong professional experience. As such, recommendation 15 of the IPC Management Board was approved, which states "all IPC professors should obtain a doctorate diploma by 2010". With this change, the R&D potential will undoubtedly increase. On a national scale, the IPC has one of the highest numbers of R&D staff amongst the polytechnic institutions, with a total of 171 researchers.

Budget

The largest part of the IPC budget comes from the National Budget, which the Institute has no intervention in.
This budget does not include funds for maintenance and equipment installation work, nor research, or any activities that arise outside of the minimum functioning of the Institution. It is spent therefore almost only on salary payments for staff. However, there are currently Schools that confirm that the budget is not even enough to pay their staff salaries. From this perspective, the budget does not grow in conjunction with the developmental needs of the institution.
The relevant law identifies two separate financial resources, one being the "Programme Contract" and the other being the "Development Contract". Until now, only the first has been applied by the previous management of the MCTES and for now there has been no possibility of presenting proposals within the remit of the second resource.

To add to the financial difficulties, there are budgetary restrictions, which mean that money from the previous fiscal year cannot be used in the following year.

Finally, it can be observed that there are institutions in the country that have excellent facilities and others, such as the IPC, which have serious financial difficulties, despite its very good performance and history of success.

### 3.2.2 – Evaluation of facility limitations

In some Schools, the condition of the buildings and their interiors is not adequate. Several laboratories need improvements and new facilities but do not have them due to a lack of funding. The lack of maintenance means the facilities worsen by the day rather than improving and developing. There is an urgent need to repair buildings that are run down or even in ruins, as well as to build new student accommodation, as the current number of beds is hugely inferior to the needs of the IPC.
Some schools, such as the ESEC, urgently need buildings of a greater capacity to hold the number of students that attend. The ESTGOH, for example, needs new facilities as it is a new and growing School and has only ever functioned out of temporary buildings.
The CSS and the SS also need new buildings as they only have temporary buildings, which were originally lent to them by another institution and are in a very undesirable state.

### 3.2.3 – Evaluation of student / teacher ratio

The student / teacher ratio is on the whole high and is largely due to the lack of teaching staff in each of the Schools as well as the lack of available funding for recruiting new teachers. As a result, the quality of teaching, namely from the Bologna Agreement's perspective, is damaged and the best and most appropriate teaching methodologies cannot be used. This applies in particular to those courses where the teaching methodology favours laboratory classes and tutorial classes, both of which are desired methods of teaching in the new paradigm.

There are imbalances between the different Schools, meaning that the required MCTES student / teacher ratios are implemented in some Schools, but not in others. Annex 2 goes into this in more detail.

### 3.2.4 – Other difficulties

There are several other difficulties that must be taken into consideration, with regards:

- The reorganisation of human resources due to legal restrictions, namely concerning human resources mobility;
- The regularization of labour contracts due to legal restrictions, especially with regards the teaching staff;
- To the standardization of procedures and relevant documents (e.g. Activity Plans and Activity Reports, Accountancy Plans and Accountancy Reports);
- The regularization of fundamental functions for the Institution's operating activities (e.g. distribution of teaching duties) due to legal restrictions;
- To the interaction between the Schools, the management boards and between teaching and non-teaching staff, due to legal restrictions.

## 3.3 – Implementation of IPO's Strategies and Plans

What kind of initiatives are being implemented to overcome the difficulties and to prepare the Institution to face the new challenges ahead?

### 3.3.1 – Academic Activities

- Working towards the accreditation of all its degrees;
- Creating new kinds of education programmes, namely Masters, Post-graduate programmes, Continuing Education and Technological Specialization degrees;
- Developing the academic improvement and the professional qualifications of the teaching staff, through the increase in the number of doctorate graduated professors.

### 3.3.2 – Financial Resources

In order to accomplish its goals and to complement the insufficient financial resources made available by the Government Budget, the IPC will need to find alternative financing sources. Some of the proposed measures are as follows:

- Create incentives for the development of R&D Projects and present them to potential financing entities;
- Increase the number of services provided to external entities, in areas which will not involve competition with the private sector;
- Take advantage of the so-called "programme contracts" and "development contracts" established by the MCTES, and develop specific projects to be financed by other ministries;
- Systematically review the fees for post-graduate programmes and continuing professional development programmes;

Despite the aforementioned measures, in the middle and long term, the IPC has to adopt a more aggressive Strategic Plan, in accordance with what is stated in part 6 of this report (Strategic Management and Capacity for Change).

### 3.3.3 – Management Activities

The Certification of the CSS and the Schools, as well as the implementation of a more modern, professional and efficient management of its human, financial and material resources is an important undertaking for the IPC. As such, the IPC aims to achieve the certification of all its services and processes by 2008, in compliance with the EN NP ISO 9001:2000 norms.

Consequently, with regards to the management of human resources and with the purpose of improving the effectiveness of the administrative services, the IPC requires appropriate regulatory tools. In reality, at first glance the number of employees per School or in the CSS can be considered adequate, yet upon closer inspection, their education and training profiles are frequently not sufficiently adequate to undertake the tasks they are supposed to perform. Despite this situation and all the legal restrictions, the IPC is trying to implement action plans directed towards the resolution of the existing skills shortages in some sectors.

As well as the aforementioned initiatives, the IPC is also installing a new fibre optic network across the Institution (some of the Schools are already connected). This will make some management processes much more efficient. Further, a shopping centre is being constructed which should be more cost effective.

# 4 – Quality Management

The IPO's President decided to implement a Quality Management System (QMS) to comply with the NP EN ISO 9001:2000 norms, with a view to streamlining processes across the Schools. This decision was made so that all the Schools could be certified and reap the following benefits:

- Have the opportunity to improve;
- Become more competitive in the face of stiff competition from similar institutions;

- To bring management of the different Schools closer together so they work in partnership with one another;

The QMS will provide an opportunity for the IPC to provide accountability to the Institutions' beneficiaries and management, to make staff and management focus on their objectives, to plan ahead, to assume responsibility, to review working processes and resource management and to get a fuller understanding of the institution's mission.

The importance of this project was duly recognized by the MCTES as they approved the IPO's Programme Contract, which clearly stated one of its core projects was the implementation of a QMS throughout the IPC in compliance with NP EN ISO 9001:2000. Currently, the CSS and the ESEC are already certified and all the other Schools are involved in the process with a view to attaining certification by 2008.

The reference document for the implementation, maintenance and improvement of the QMS is the Quality Manual. On a yearly basis a quality evaluation is undertaken in which system and quality analysis is evaluated against the established indicators. This allows the IPC to then form strategic plans and new aims and objectives for the following year, with a view to continual improvement.

The President of the IPC is the person responsible for the implementation, application and development of the QMS, in terms of laying down the conditions in which the whole Institute will undertake the process. In particular, the President is responsible for the definition, approval and dissemination of the Quality Policy (QP) amongst the CSS employees, IPC beneficiaries and suppliers. In drafting the QP, the President uses the relevant legislation as a point of reference and takes into consideration the needs and expectations of the beneficiaries as well as the available material and human resources.

The QP is translated into the Annual Objectives, which are monitored through a tri-masterly verification process, which in turn allows for the certification of the correct implementation and organizational understanding of the QP.

On an annual basis, the President assesses whether the QP is up-to-date and relevant in the face of new internal and external developments, be they legislative, cultural etc. The President undertakes this assessment using the Reviewing Process outlined in the QMS. In so doing, the President can give assurance that the Schools have been reviewed against the correct legal framework and that the teaching bodies have been assessed with regards the appropriate services they are responsible for delivering. The results of these assessments are then used during the QMS review and in the wider planning processes.

In the CSS there are two different but complementary levels of quality planning:

1) The first is carried out during the Quality System review and deals, in general terms, with the QMS, the needs and the satisfaction of the beneficiaries, the availability and suitability of the human and the material resources to the QP. The result is a number of registered decisions relating to the strengthening of the organization, its processes, methods and the Cuss's resources;
2) The second level of quality planning is developed at the Cuss's service level. It aims to identify and plan the Cuss's processes and their corresponding activities, means, criteria and resources needed to ensure the services will be delivered in accordance with the applicable requirements. This is carried out at different stages dependent on the delivery of different parts of the service and in agreement with the applicable Working Procedure.

The system provides an opportunity to reorganize services, to clarify processes and procedures, to quantify objectives, to define ratios, establish goals, and improve the Cuss's ways of working as well as the IPO's general image. It also allows the IPC to self-impose a policy of continual rigor and a requirement that it takes on an increasingly sophisticated character, be that internally or externally.
The adoption of the QMS was a stimulus for submitting its evaluation to the European University Association (EUA).

Despite all the aforementioned advantages, whilst the QMS does encourage increased professionalism, it does not bring more money to the institution, nor does it dispel internal political in fighting.
The QMS is a dynamic system, which induces the creation of new procedures and the correction of current ones. In the near future, the IPC will create "Quality Circles" and will continue to use the tools of the Quality System.

The strengths, weaknesses, risks and opportunities of the QMS are as follows:

Strengths:
All personnel are involved; it increases individual responsibility and accountability, eliminates redundancies, standardizes processes, defines qualitative and quantitative goals, improves efficiency, enhances the IPO's image, seeks continued improvements in client-service delivery and improves internal communications.

Weaknesses:
Difficulty of understanding the system, greater public exposure of IPO's weaknesses, scarcity of resources, failures can assume a bigger importance and increased bureaucratization of processes.

Risks:
Failure to implement the QMS, non-accomplishment of goals, internal resistance to change and the implementation of the new system, difficulties in the execution of permanent monitoring, non-implementation of improvement plans.

Opportunities:
Change and elimination of dysfunctional working procedures, increased institutional coherence, implementation of internal reorganization, increase in the rigorousness of working processes, quantification of performance, increased client satisfaction, development of new competencies and skills.

# 5 – Student Services (SS)

Accompanying the growing number of students in the IPC has been the increase in numbers of students applying for scholarships, from 1,415 in 1996/97 to 2,483 in 2005/2006. The number of students subsequently awarded a scholarship in the same period increased from 1,117 to 1,926 (see Annex 1 – Table 8).

With regards to the food services offered by SS, in order to offer students meals at affordable prices, the SS has opened six canteens, three of which are run directly by the SS and three of which are run privately, which together offer a total capacity of 1,016 seats. The SS also has three bars, one which is run by the SS and 2 are private.

Even though the seating capacity in the canteens has risen thanks to the opening of new facilities, the ratio of students to seats has not improved, from 11.2 seating places per 100 students in 1996 to 11.4 in 2006. By means of comparison, according to recent statistics, the average national figures for 2002 show that within universities, the average is 11, 8 and within polytechnics it is 9, 74 (Annex 1, Table 9).

Regarding accommodation, the SS aims to provide a suitable work and living environment for its students. The SS offers some modern student accommodation – two grounds in Ben anta (one for boys and one for girls, with a total bed capacity of 200); another ground in Quintal ad Nora which is made up of 4 buildings comprising 148 beds (74 for boys and 74 for girls) and finally two houses in the ESAC, one with 17 beds and the other with 6 beds.
There has been a clear improvement in the number of available student beds, thanks to PIDDAC and Feeder's assistance with the construction of new facilities. It has risen from 2 beds per 100 students in 2002/2003 to 4.1 beds per 100 students in 2005/2006. However, the

IPC is still below the 2002 public higher education average, which is 5 beds per 100 students for universities and 4.6 beds per 100 students for Polytechnics. Furthermore, the number of students applying for accommodation space is around two times greater than the number of available beds (Annex 1, Tables 10 and 11).

With regards health care services, the IPC has owned and run its own clinic since 2003. Besides offering general medical consultations, it also provides family planning and psychology, dentistry, optician, acupuncture and homeopathy services. There has been a high demand for these services within the student community. In the short term, there are plans to enlarge the facilities with a view to offering more services, such as physiotherapy, cardio-pneumology and biological testing. These last improvements will be carried out in collaboration with the ESTeSC, the IPC School for Health Technologies.

Regarding sporting facilities, the students have use of a sports ground, which includes a rugby and football pitch and two other multi-use facilities. At the end of 2003, the SS opened a Gym with cardio-fitness and weight training facilities, which had 360 members in 2004 and 380 in 2005.

Given that undertaking sports and physical activity contributes greatly to the psychosocial development of young people and helps them to integrate socially with one another, the SS plans to invest more in the area. As such, it has established a support structure for developing existing and new sporting activities across all the School. These plans are limited, however, due to the lack of a multi-sports arena, although the IPC has submitted a project plan to the PIDDAC for funding this.

Besides the aforementioned plans, the SS is also undertaking or seeking to undertake the following actions oriented towards providing a wide support network for its students:

- In 2004, the Active Life Unit (UNIVA) was formed as part of the SS (see Annex 1 – Table 13);
- To open a crèche for the children of IPC students;
- To increase investment in cultural activities, which has been difficult until now due to a lack of financing.

The lack of funding, the difficulty of contracting staff and the sub-standard facilities are currently the biggest restrictions in the effective functioning and development of SS services.

The funding from the national budget is not distributed based upon the requirements of each institution, taking into consideration indicators such as the number of students, scholarships, availability of bed space and the state of the catering and other facilities. Rather, it is distributed along historical lines and dependent upon past spending and budget patterns, and without transparent and fair rules.
Further, although funding for the SASs has increased in absolute terms since 1997, it has not increased sufficiently to keep up with the growth in service demand due to the rising number of client users (namely of canteens and accommodation). The consequence of this has been twofold; firstly the SS has had to increase spending. Secondly, it has had to increasingly raise its own funds through fundraising activities (see Annex 1, table 14).

As regards to the staff situation (see Annex 1, Table 14), the current legal restrictions regarding contracting employees restrict management choices, such as not being able to have direct management of services (such as the accommodation and canteens), but rather having to contract these to private companies. In addition, the services provided by the SS are administered by a team of only 15 people, which does not allow for the implementation of one of the most important features of internal control: the separation of duties. By way of comparison, according to the latest figures, in 2002 the ratio of staff to students in the SS was 135 to 1, whereas in the SS of the University of Coimbra the ratio was 32 students to every employee.

Finally, with regards the facilities and building, it is of note that since 1996 the SS Administrative Department has been working in a building which is at an advanced state of disrepair and which was officially closed by order of the Coimbra Municipal Council in October 2005, due to the lack of salubrious and safe working conditions. They only moved buildings in July 2006 to some

temporary buildings, and are in urgent need of a new permanent building. This situation delayed the implementation of the ISO 9001 review process, despite this being considered a priority in order to improve the quality of the services they provide.

# 6 – Strategic Management and Capacity for Change

Given the stage of development that the IPC is at, it needs to face the future in a pro-active manner, taking into consideration its endogenous potential and the respective surrounding social context as well as the institution's profile thus far outlined. From this perspective, the strategic management and the planned implementation of change is outlined in the following items.

## 6.1 – Strategic Areas

### 6.1.1 – Strategic Area 1 – Training and Education

- Accredited courses - All courses must be accredited by the relevant institutions. Courses that are taught in partnership across two or more Schools (in order to maximise resources and to generate working partnerships) can complement the courses offered individually by Schools in their respective scientific areas.
- Masters Degrees – Creation of Masters degrees with a professionalizing orientation, and giving priority to dissertations focusing on working life and internships in businesses.
- Doctorate and Post-Doctorate Degrees – Until there is a change in legislation to allow PhDs to be undertaken internally, these will be undertaken in conjunction with other national and international institutions. In its first phase, they will be pursued individually beginning with the teaching staff most competent for undertaking one.
- Every course that includes an obligatory curricular or professional internship: one student, one internship, one tutor.

Recognizing that its principal objective is to train quality and competent professionals, the IPC will put all its effort into consolidating and reinforcing its position amongst the best higher education institutions in the country. It will equally seek to find a place on the international arena, in the aftermath of this period of re-organization of higher education system from the Bologna Agreement. It will therefore take on a wider vision with regards to the spectrum of courses on offer.

#### 6.1.1.1 –Level 4 Professional Qualification Programmes

- Implement Technological Specialization Courses and lay down the conditions so that these students continue their studies at IPC, thus creating a close bond between these students (and ex-students) and the Schools in which they studied.

- Another area of course delivery under this section is related to honouring agreements and contracts with specific organisations that have training requirements that the IPC can assist with.

#### 6.1.1.2 – Level 1 Degrees

Taking into consideration the fundamental role that degree-level education has in society and for the external recognition of the institution, the IPC will develop their Bachelors Degree programmes with a view to attracting more and better students. It will use its current capacity as a reference point (with the exception of ESTGOH, which is forecasted to continue to grow),

for developing and updating its disciplinary content, for creating a satisfactory cultural environment for the development of its students, for paying special attention to the continually improving quality of teaching, and for the diversification of its courses so it can offer its students the facilities and opportunities available in institutions of excellence. To achieve these objectives, the IPC will undertake the following actions (amongst others).

1. Curricular Reform
    a) The Schools will undertake regular reviews of their diverse courses with a view to implementing and maintaining the ECTS and their respective curricula up-to-date and valid.
    b) Define a new model for the curricula reviews so that they are more coherent and efficient, as well as a better definition of responsibilities.
    c) Encourage the implementation of inter-School courses.
    d) Encourage the implementation of international courses.
    e) Make better use of resources (especially human resources) by facilitating freedom of movement between the different Schools.
    f) Create a teaching environment that stimulates initiative and development of learning capacity.
    g) Reinforce the relationships with the labour market by undertaking more internships as a part of all courses, of at least one semester duration.
    h) Consider using teaching methodologies that take into account the professional experience that many students already have.
    i) Encourage extra-curricula activities that help students to develop.
    j) Create an 'Educational Observatory' aimed at analysing international trends and fore-seeing labour and education markets needs, as well as monitoring internal trends and how best to match these to external ones.

2. Reinforcement of Academic Support to Students
    a) Encourage the early detection of student's problems and offer appropriate assistance.
    b) Encourage communication between students and management, services, the departments, directors and teaching staff via electronic means such as email and specific portals for this purpose.
    c) Involve the teaching staff more in the support services offered to students (such as counselling) and ensure they are available for students and that proper use is made of tutorials.
    d) Ensure the goal of one student, one internship, one tutor, is reached in the final stage of the implementation of the Bologna Agreement;

3. Ensuring the Provision of Quality Education

    a) Emphasize and promote the role of Course Directors.
    b) Encourage the provision of training opportunities for all teaching staff with a view to improving their teaching and / or their scientific abilities.
    c) Create incentives for those who develop excellent teaching practices, namely reinforcing the importance of the teaching function for career promotion and progression amongst the teaching staff.
    d) Reinforce the role of pedagogical enquiries as an instrument for improving teaching quality.
    e) Work on improving study so as to detect and overcome the worst cases of scholarly failure.
    f) Assign greater importance to the self-evaluation review processes of the different taught courses so that this becomes an increasingly fundamental pillar in the quality control system of the IPC.
    g) Encourage a permanent international evaluation of the IPC, so it increasingly has a comparable international dimension.
    h) Develop and promote the use of modern teaching technology, such as multimedia technology, computer-assisted teaching and distance learning technology.

i) Improve the laboratory equipment through the development of research projects appealing to external investment;
j) Provide the students with a positive educational environment, with regards the infrastructure, human, material and administrative resources.

4. Improve the IPC's attractiveness to secondary school students.
   a) Maintain the target of 9000 students as a limit for the number of students on degree and Masters courses, across all the IPC's Schools.
   b) Actively promote the IPC as an Institution that takes in good students and produces excellent professionals and future leaders:
      i. Update and make the IPC's promotional material more attractive.
      ii. Enlarge the geographical recruitment area students come from each year.
      iii. Develop plans to attract more secondary school students so that the IPC increasingly raises its entry requirements.
      iv. Increase the number of secondary school visits with well-trained and well-motivated teams.
      v. Increase the number of open days.
      vi. Actively participate in the organizations that work in Science and Technology R&D.

   c) Improve the support services to students around getting jobs after graduating within a competitive job market environment.
   d) Continue to develop cultural and sporting activities via IPC sports teams, choir, musical groups, debating groups, social action groups etc.
   e) Create an Alumni Association, which can follow alumni's professional development, track the IPC's evolution and offer special services to alumni so as to maintain contact with all IPC's ex-students.

5. Create conditions on the degree courses whereby those students with the greatest potential can thrive.

### 6.1.1.3 – Post-graduate Programmes

Owing to the increasingly important role of continuing professional development, the IPC will progressively develop its post-graduate training programmes; both at Masters level and (dependent on the relevant legislative restrictions) at Doctoral level. It will seek to offer these courses for people at different stages of their professional and academic lives and to make their content, form and timetables flexible. This will be done by the following means:

1. Establish joint doctorate programs, in partnership with other institutions:
   a) Create Doctorate programmes in areas where there are adequate competencies.
   b) Encourage PhD students who have a competency for particular research areas that have the potential to easily integrate with the commercial world, and that will promote the recognition of this qualification as a respected professional skill.

2. Promote Masters Degree Programmes:
   a) Offer Masters programmes that are relevant and suitable for the market, as well as the development of the respective academic areas.
   b) Guarantee adequate curricula reviews as well as delivery that is in agreement with high quality standards.
   c) Look to create the right conditions so that technical staff from private companies will be attracted to undertake Masters courses at the IPC.
   d) Work with companies, especially with regards to dissertation research.

e) Take into consideration that in certain situations, an internship may be more beneficial than a dissertation with a view to creating a greater link with the working world.

3. Increase Continuing Education Programmes

a) Identify the areas in which the IPC has some comparative advantages in relation to the rest of the market and develop or expand new continuing education programmes in order to fill market gaps.
b) In these areas, develop the existing and create new programmes on continuing training, based on the specialised degree areas and Masters disciplines already being taught, so that executives and other professionals can update their skills and knowledge and apply this knowledge and research to their jobs.
c) Develop life long training programmes, for its graduates and others, especially in areas where continual education is required by law, by professional bodies or others.
d) Encourage businesses and other institutions to make use of the IPC's continuing education courses and tailor make courses to suit their needs.
e) Use *interface* institutions to publicise these courses.
f) Encourage the involvement of teaching and technical staff in the organisation and delivery of these courses.
g) Develop the IT, communications and logistical infrastructure that will allow for the development of a distance learning option and in particular the use of virtual laboratories, both nationally and internationally.
h) Introduce the ECTS into these courses.

### 6.1.2 – Strategic Area 2 – R&D

- The IPC aims to become a centre of R&D excellence in Food and Environmental Sciences, both nationally and internationally. Given the central importance of the relation between food, water and environmental issues for the future of Mankind, the IPC will work to contribute to this wide debate and present its findings and solutions.

- The value of the contracts for the transfer of knowledge to the business sector should rise annually until they reach the same level as the leading higher education institutions.

- Stimulate the research activities in situ, when the appropriate academic and scientific conditions are available. In particular it plans to create two more research centres accredited by the FCT. Whenever possible, external researchers should form a part of the IPC research teams and equally IPC researchers should be a part of research teams in other institutions in order to enrich the knowledge base of the IPC.

Recognising the crucial role of R&D activities in supporting good quality teaching, the IPC will seek to take a central position at the national and international level within the research and development domain.

In order to accomplish these goals, the IPC will adopt the following measures:

1. Encourage its teaching and research staff to look for financial resources to undertake R&D activities:
   a) Develop incentives for them to find external funding.
   b) Assist the new teaching staff to integrate, so as to help them be more productive researchers.
   c) Increase the recruitment of post-graduate students, namely, through the growth of scholarship provision.
   d) Open up recourses to EU funding as well as participating in international cooperation programmes.

2. Encourage the formal implementation of research units, namely the ones with an interdisciplinary character.
3. Stimulate the publication of research articles in important scientific reviews with a view to reaching the goal of publishing one article per doctor per year.
4. Encourage the presentation of communications in renowned congresses and conferences, with a similar goal of one researcher, one publication per year.
5. Create a common fund to support emerging research projects of strategic importance to the IPC, especially in areas that are not already being specifically financed.
6. Improve, enlarge and create infrastructures for research, development and transfer of knowledge, recognising the fundamental importance of such activities in the IPC's mission, in the awarding of funding and of student development.
7. Develop an intellectual property initiative, oriented towards the registration of intellectual property rights and patents.
8. One of the IPC's aims is to make its capacity to relate theory into practice one of its distinctive qualities. Recognising this, it will develop mechanisms for encouraging the transfer of knowledge to the business sector and in particular for encouraging the creation of new businesses and for attracting private investment into IPC research and development activities.
9. Enlarge the administrative support for the existing research groups, especially in the fields of accountancy and financial management.
10. Support and actively publicise the IPC's R&D centres of excellence.

### 6.1.3 – Strategic Area 3 – Internationalisation

The IPC aims to "internationalise" by increasing staff and student exchanges internationally, introducing transnational training courses and forming partnerships with institutions in PALOP countries. It will continue down its current path primarily focused on European institutions and teaching methods as well as continuing the long history of cooperation and friendship with the PALOP countries.

The IPC's internationalisation plan can be summarised along two complementary lines – with the non-PALOP countries and with the PALOP countries, as follows.

### 6.1.3.1- Non-PALOP countries

Recognising the importance of internationalisation in order to achieve its goals, the IPC aims to increase cooperation with internationally recognised and prestigious institution both at the teaching and at the R&D level. To achieve this, the IPC will undertake the following actions (amongst others):

1. Encourage bi-lateral teacher mobility between the IPC and its international partners, finances permitting;
2. Encourage student mobility, increasing the number of IPC students who go to study abroad and in particular, seek to significantly increase the attraction and capacity of the IPC in order to appeal to foreign students.
3. Encourage IPC students to undertake internships in foreign companies.
4. Encourage foreign students to enrol in the IPC. In particular, seek to recruit students who will have a greater probability in the future of attaining leading professional positions in the areas of academia, business or politics.
5. Aim to deliver some post-graduate courses in English.
6. Reinforce the relationship with former foreign IPC students.
7. Instigate greater IPC participation in internationally funded R&D projects in collaboration with national and foreign businesses and institutions.
8. Instigate the introduction of UNESCO experts in the training of IPC teachers.
9. Implement the Erasmus Mundus programme.

### 6.1.3.2. – PALOP Countries

For historical and linguistic reasons the Portuguese speaking countries are natural partners of Portugal, and therefore of the IPC. The IPC proposes the following actions:

1. Reinforce cooperation with Schools from PALOP countries, aiming to build local capacity.
2. Promote exchange programmes between PALOP country students and the IPC, especially at Masters level and in particular seek to recruit students who are likely to occupy leadership positions in the future in academia, business or government.
3. Encourage IPC's teaching staff to develop projects in the PALOP countries in areas of mutual academic, business or political interest.

## 6.1.4 – Strategic Area 4 – Organization and Management

A certified Institution: certification of the CSS, the Schools, the SS; implement the new Information System for Document and Content Management. Due to its short history and to the city in which it is located, the IPC will have to prove itself by demonstrating the correct validation and certification of its constituent parts.

### 6.1.4.1. – New Organizational structure

Recognising the fundamental importance that the correct use of its resources has in achieving its mission, the IPC will manage its human, financial and historical resources in a much more professional and efficient manner. To achieve this goal, the IPC aims to undertake the following actions (amongst others):

1. Complete the certification process in all the IPC schools and services, in accordance with the EN NP ISO 9001:2000 norm;
2. Undertake the certification of SS including its accommodation and catering facilities;
3. Ensure the Institution continues to be evaluated by the EUA;
4. Modify the IPC statute so as to introduce any new legislative reforms;
5. Encourage external representation in the management of the IPC;
6. Seek to ensure that the majority of the management duties are undertaken by experienced staff who have made a career within the IPC so as to guarantee continuity.
7. Complete the "zero paper" incentive and promote good and transparent management practices.
8. Further develop the financial and administrative management support services.

### 6.1.4.2. - Human Resources

Recognising the importance of the intellectual, scientific and technological knowledge and capacity of its staff, the IPC will define and disseminate the criteria to be used in the recruitment and promotion of it teaching, technical, administrative and auxiliary staff and will promote the necessary training activities to guarantee their continual professional development and their ability to undertake their jobs. It will also seek to permanently guarantee that the most competent and committed staff members will be able to further their careers within the IPC. In order to achieve these goals, the IPC will undertake the following actions (amongst others):

1. Draft a guidance note on the quality of teaching and research staff. This should give priority to the quality of teaching and research staff relative to their quantity. The criteria should include levels of excellence that will allow for the development of a highly qualified staff body, both at a scientific and a professional level.
2. Define criteria for the recruitment and promotion of technical, administrative and auxiliary staff. Having good quality staff in these areas is crucial for achieving the IPC's mission.

3. Implement SIADAP (Integration System for Public Administration Evaluation).
4. Increasingly improve the annual training plan so as to continually assess the qualification status of all IPC staff and create professional development opportunities for staff.
5. Create the conditions to ensure a human, attractive and motivating working environment.
6. Seek to achieve a full complement of non-teaching staff.

### 6.1.4.3 – External Cooperation

Considering the mutual benefits that come from a close relationship with companies and other external institutions, the IPC will progressively increase its activities with these. In particular it aims to offer more services to and undertake R&D projects with industrial, service and commercial companies, as well as with public bodies. The achievement of these goals will be undertaken by the following actions (amongst others):

1. Instigate training programmes in private companies for final year students on every degree course, especially in those degrees where an internship is an integral part of their curriculum.
2. Create an exchange programme for the IPC's teaching staff and for company employees with a view to undertaking internships away from one's normal workplace.
3. Encourage business participation in the Masters and PhD courses on offer at the different IPC Schools, be it so their staff can undertake further training in their respective areas, be it so they can undertake projects relevant to their business or to complete Masters or PhD dissertations.
4. Encourage the participation of company staff in the delivery of modules of IPC courses.
5. Undertake R&D projects that have a common interest with the business activities. Develop a cooperative relationship that contributes to a better identification and definition of the projects from the business side.
6. Publicize the IPC's efforts with the intention of earning money from R&D activities.
7. Develop an exposure campaign to show the IPC's potential and activities, via appropriate visits to businesses.
8. Reinforce consultancy activities in the areas the IPC has a recognised competency in and which do not compete with similar commercial activities.
9. Encourage the implementation of continuing education courses that are catered towards specific business needs.
10. Promote discussions jointly with businesses to analyse the content of the IPC's taught courses.
11. Encourage the voluntary participation of students, teaching staff, researchers and non-teaching staff in appropriate public service activities.
12. Promote public discussion around subjects related to society at a regional or national level and encourage campaigning work by staff on technical and / or cultural subjects that are in the public interest.
13. Encourage a closer cooperation with secondary schools with a view to coordinate programmes and facilitate student integration into higher education.

### 6.1.4.4. – Publication of Activity Plans and Reports

Considering society's growing interest in the performance of Higher Education Institutions, the IPC will develop public accountability initiatives through the following measures:

1. Annual publication (until April 30th) of a complete report on the previous year's activities and accounts, which will be largely disseminated through public communications and direct mailing to businesses and institution with whom the IPC has direct links.
2. Instigate audits of its accounts by independent firms, and publish these results.
3. Actively promote the accreditation processes and the course evaluations and publish these results.

4. Increase R&D activities, promote external participation, debate the evaluation results amongst competent bodies and publish these widely.

### 6.1.4.5 – Own revenues

In order to complement its limited financial resources, the IPC will have to find alternative financing sources, so as to achieve its strategic goals. Recognizing that links with the local community are extremely important, the IPC will continue to forge relationships with them. Hence, the following initiatives will be necessary:

1. Instigate business sponsorship for teaching purposes.
2. Encourage business participation in equipping laboratories.
3. Involve previous IPC students in fundraising activities.
4. Encourage the donation of money to the IPC via wills and legacies.
5. Continue to propose R&D projects to financing institutions.
6. Enlarge activities around delivering services to external bodies in areas the IPC has specific competencies in and which do not compete with businesses.
7. Encourage registration of intellectual property resulting from R&D and actively promote their commercialisation.
8. Develop products that disseminate IPC's image and continue its aggressive marketing campaign, in particular amongst students.
9. Systematically review tuition fees policies for post-graduate and continuing education courses.
10. Present development project proposals in strategic areas to foundations and other financing institutions.
11. Use the funding from the contract programmes and development contracts created by the Ministry, as well as present project proposals for funding to other Ministries outside the MCTES.

## 6.1.5 – Strategic Area 5 – Information Systems

*Zero Paper, maximizing effectiveness*, through the use of information technologies and appropriate management models.

### 6.1.5.1 – Use and Interaction of Computer and Information resources

The IPC will ensure that its computer resources are kept up-to-date and are made widely accessible. It will promote links between the Schools in order to share internal knowledge and encourage innovation. It will do this via the following means:

1. Install a good quality fibre optic network across all IPC Schools and departments to give access to the Internet;

a) Facilitate remote access to the IPC network, for the whole IPC community;
b) Ensure 24 / 7 access to these resources by creating appropriate maintenance services;

2. Ensure there are a sufficient number of good quality and appropriate computer workstations for all the teaching and non-teaching staff and the students.
    a) Install wi-fi access in all the IPC Schools, departments and student residences;
    b) Create a fibre optic network in all the IPC's Schools in the following sequence of linkage:
        i. Schools on the right hand side of the Mondego River
        ii. Schools on the left hand side of the Mondego River
        iii. ESTGOH
    c) Ensure there is always a sufficient number of computer rooms and laboratories as the student population grows to ensure everyone's right to access these and to comply with health and safety regulations.

d) Forecast hardware and software requirements when drafting the annual budget.
e) Encourage the use of information systems and applications for the different fields of expertise and reinforce the policy of having user licences across the campuses.

3. Offer the R&D community high quality and up-to-date IT resources in keeping with their needs and the Institution's interests. Encourage their use, be it internally or by external bodies, via their dissemination and adequate training in their use.
4. Plan and create an IT assistance service for the different Schools, promoting a good quality working environment for teaching, research and management.
5. Create a teaching support unit, which will allow the development of innovative teaching methods in the context of Information and Computer Technology. This unit should be made up of specialists from different areas and should ensure technical support to the teaching staff in the efficient and effective use of the IT systems in teaching and learning.
6. Continually evaluate these investments and services, in particular focusing on their value and use, innovation and cost / benefit analysis.

## 6.1.5.2 – Access Gate

Considering the strategic importance of information technologies in education and R&D, the IPC will continue to develop infrastructures and information services which provide a regional and national link between its libraries as well as with external institutions. This goal will be achieved via the following measures:

1. Increase communication between Schools and between Schools and externally as well as keeping the use of the Internet up-to-date and appropriate.

a) Make relevant social and scientific teaching material available.
b) Facilitate research of scientific information and disseminate research findings.
   i. Ensure the systematic and exhaustive bibliographic registration of scientific publications by IPC members of staff takes place.
   ii. Promote the creation of an electronic journal including a selection of said publications.
   iii. Make information available online regarding the projects that the IPC is undertaking or is cooperating in.
c) Make relevant monitoring and support information available to IPC management so they can make informed decisions regarding IPC activity.
d) Facilitate access to legislation relevant to the IPC.

2. Encourage the development of the School libraries.

a) Enrich and update the library resources, by acquiring new and diverse publications relevant to the needs and areas of teaching and research.
b) Allow access to external research resources and services, in particular the use of *B-on*.
c) Offer the use of a helpdesk that can give individual support and increase electronic communication amongst users.
d) Provide a sufficient number of study spaces, bearing in mind the diversity in ways of working and the needs of the different users.
e) Develop and disseminate a documentation and information service to support businesses, especially in the Central Region of Portugal.
f) Develop and disseminate a documentation and information service in English to support foreign businesses.
g) Partake in national and international cooperation and R&D initiatives. Continually evaluate investments and services implemented, especially with regards their cost / benefit value.

3. Develop the IPC editorial line, so as to support the editing of IPC publications.

### 6.1.6 Strategic Area 6 – Image and Communication

The IPC seeks to achieve excellence particularly in the areas where such potential exists, be that in undergraduate or post-graduate training, or in its research and development activities. Its levels of excellence should be evidenced and disseminated via intra-institutional communications and to the outside world.

Recognising that having an attractive image plays an important part in the creation of an institutional sense of identity, in stimulating the interest of potential future students and in making a statement in the community, the IPC will continue to invest in the creation of a strong, consistent and appealing image. To achieve this goal, the IPC will take the following measures:

1. Develop an attractive institutional image and promote this within the whole Institution, so this image becomes widely recognised.
2. Gather and disseminate information on IPC's (current and past) staff and students who are involved in large national and international projects or who are in important and influential positions.
3. Promote the cooperation between the IPC and well-respected institutions that are dedicated to the promotion and dissemination of knowledge.
4. Encourage the IPC's participation in large national and international projects in the area of research and continuing education.
5. Encourage the IPC's participation in respected international institutions and associations.
6. Encourage the IPC's participation in bodies that define strategy, develop education, form scientific and technological policies and evaluate projects and programmes.
7. Encourage IPC staff to organise international conferences that are relevant and have a high impact within their scientific and professional communities.
8. Promote and widely disseminate R&D results, in technical and scientific publications and via teaching and training.
9. Continue to improve all published material disseminated on the IPC and its activities.
10. Continue to develop and improve IPC's marketing material.
11. Ensure all publications by IPC staff in books, journals or reports and all communications in conferences, seminars or other similar events, feature a clear reference to the IPC at the beginning.

## 6.2 – Structural Area – Alimentarium3

The *Alimentarium* Project was proposed under the scope of SS, due to the importance food has in the services it provides. Nonetheless, the universal characteristic of food is relevant to all the Schools and so justifies a mention in the strategic plan here outlined.

The theme of food and the environment was chosen as focal points for the IPC's R&D activities, mostly due to the fact that this subject is one of the IPC's strongest competencies and also because it is a big potential growth area. Furthermore, the IPC considers the study of the environment a particularly important one for the present and for the future.

As such, the Alimentarium brings together these two themes of environment and food and thus draws on the IPC's endogenous knowledge and scientific specialities.

The Alimentarium is based on the idea of the food cycle, and will grow out of the following initiatives:

- An R&D Centre on environment and food. This unit aims to have a strong input from private companies, be it for the financing, the equipping of the laboratories or the establishment of centres that have a business orientation within the unit.

[3] Alimentarium from the Portuguese verb 'alimentar' to feed.

- The Alimentarium should also provide the space for nurturing new businesses, be they start-ups or spin-offs.
- The Alimentarium will have a food museum.
- The Alimentarium will also be a place of leisure and will bring science to life through pedagogical gardens and thematic spaces such as a butterfly and birdhouse and a silkworm tank, amongst others.
- Given its well-rounded character, the Alimentarium will attract a wide public "from 8 to 80 year olds".
- The Alimentarium will be built in the ESAC campus, so as to make the most of the Casa do Bispo (Bishop's House) space and the impressive surrounding landscape. It will aim to not disrupt nature but rather to help conserve the valley and the oak trees located around it.
- In this context, there will be the option of accessing the Alimentarium by open-air carriage, which will take you all the way through the ESAC campus to the state of the art R&D facilities on the other side.
- The Alimentarium will be a space to be used by all the Schools even though it is located in the ESAC campus.
- The Alimentarium will be the largest such space dedicated to the research of food and the environment in the Iberian Peninsula.
- It is suggested that owing to the specifications of this project, the management and organisational model, which should be used, is that of a foundation, such as the IPCoimbra Foundation.
- It hopes to open the Alimentarium project in 2007, once the political situation in the IPC has settled.

This project was first presented internally to the School Directors and student associations and also to organisations from the city of Coimbra. It received a highly positive response from all those who saw it.

It has always been a difficult project to implement due to the volume of investment it requires, however, at the moment it is proving even more difficult due to the current economic recession and to the fact that the Central Administration is paying less attention to the Polytechnic Education System. However, it is believed that its viability continues to be assured.

A summary of the management model proposed for the Alimentarium project is as follows:
- IPC Foundation: Management of all the fixed assets of the Alimentarium; Management of the Alimentarium; Relationship between the Alimentarium and the IPC; Relationship between the Alimentarium and the Central Administration.
- Investment: Public – private partnerships; Applications to community funds; Applications to national projects; patronage funding; R&D Projects, PIDDAC; Others.
- Sustainability: Project revenue; Renting to and sharing space with private companies; Renting space to start-ups and spin-offs; Revenue from research projects; Entrance tickets to the museum, exhibitions and leisure areas.

As this project is only possible with ESAC's collaboration, ESAC should share in some of the Alimentarium's revenues in order to pay for the space it is using and to support ESAC's long-term sustainability.

# 7 - Conclusion

The IPC is an institution made up of a federation of schools, each with its own distinct culture and historical development. This federative structure benefits and complements each School's endogenous capacities, but it also weakens them in times of internal conflict. It can also restrict opportunities of closer cooperation and joint working. Additionally, the IPC is still often confused with the Central Support Services, a fruit of the differing historical paths of each School. There is still a lack of a definitive consolidation between the different Schools within the IPC, which is disappointing for an institution that is in a leading position within Portugal's higher education system.

However, the IPC has progressively managed to reconcile the diverse cultures of its Schools under a common goal. This goal is for the IPC to remain competitive in a city that has an emblematic rival, the oldest university in the country and one of the oldest in Europe, the University of Coimbra. When students are choosing their higher education institution in Portugal, there is still a lot of weight attached to the prestige of attending a university, so the IPC has to make a huge effort to make the polytechnic option in Coimbra more appealing. As a consequence, a certification of the CSS and the different Schools that shows good indicators in its human resources, employability of its graduates, international exchange programmes, national and international awards, partnerships with important regional, national and international companies and institutions, is fundamentally important for making the IPC an attractive choice of institution.

Having to compete in the same city as the oldest university in the country and in a country where there is currently an excess of higher education courses on offer and in which there has been a demographic recession in the number of higher education students, the IPC has to apply increasingly higher levels of excellence. It also has to ensure that its levels of excellence are disseminated amongst the wider society and that it continues to keep its student body content and to offer good quality courses. Only then can it be in a position to overcome future challenges as well as achieve its objectives.

To be the best polytechnic in the country, and to make this visible to the wider society, is the motto the IPC uses to guarantee an effective and solid leadership and to be able to be ambitious and grow. In all, it knows that it will only achieve this with a strong determination and with hard work, as well as with the humility of someone who knows that the path to success is ridden with difficulties that require strength to overcome them unshaken.