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Development of a culture based on strategic and knowledge management of a Brazilian public research institute: the case of the Nuclear and Energetic Research Institute - IPEN

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Abstract:

The article presents how a historically Brazilian public research institute oriented to one client – the Government – is developing an organizational remodeling effort based on strategic and knowledge management and based on a new public policy addressed to the regional development of the State of São Paulo. The main purpose of the article is to report how these two new experiences are being implemented at IPEN. The article will also present the main benefits of these efforts as well as the recommendations from the lessons learned in order to help the replication of the experience for other public R&D organizations.

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Abstract

The present article aims to present how a historically Brazilian public research institute oriented to one client – the Government – is developing an organizational remodeling effort based on strategic and knowledge management and based on a new public policy addressed to the regional development of the State of São Paulo. The main purpose of the article is to report how these two new experiences are being implemented at IPEN. The article will also present the main benefits of these efforts as well as the recommendations from the lessons learned in order to help the replication of the experience for other public R&D organizations.

1. Introduction

The Nuclear and Energetic Research Institute – IPEN is a public research institute for nuclear technology and correlated areas. It was founded in 1956. It is financially supported by the Science and Technology Ministry (MCT) through the Nuclear Energy National Committee (CNEN) and is associated, in its post-graduate and graduate program, with the University of São Paulo (USP).

The historical mandate of IPEN was to follow governmental instructions. In other words, IPEN was working, in symbolic terms, for only one client. This situation lasted until the middle of the nineties. At that time the Brazilian Nuclear Program lost its priority and the Institute recognized the need to develop a strategic plan process toward the market direction, the search of new sources of income, including national and international fomentation agencies and strengthening its regional public political actions by participating in a small technology business incubation program and technology park model development, for the metropolitan region of São Paulo city.

Nowadays, IPEN has a permanent manpower of more than 1000 professionals (over 300 of them are doctors and masters) and approximately 550 are students. The total budget of IPEN

is approximately US$ 40 million. By selling its products and services, IPEN generates an income of approximately US$ 11 million.

IPEN also supports the biggest Technology Business Incubation program of Brazil (CIETEC), in partnership with the University of São Paulo, São Paulo State Government, MCT and Technology Research Institute (IPT), where 104 high technology based companies are being incubated, in three stages: pre-incubation, resident companies and "incubator without walls". Most of these companies are start-up from the University of São Paulo, IPEN and other research institutes located in the Sate of São Paulo.

2. New institutional and organizational challenges

Within the new context, institutional and organizational challenges were posed:

- Firstly, following the decision on attributing priority to the nuclear medicine technology, IPEN would need to develop, manufacture and sell products and offer services to a new and "real" client – hospitals, clinics and the medical community in general terms (in Brazil all activities with nuclear materials – extraction, production and dealing - are under governmental monopole). This strategy demanded the implementation of management techniques at IPEN. Thus, in 1996, in order to formalize production procedures and to learn and develop managerial practices to satisfy the client's expectations, IPEN started an ISO certification program for its nuclear medicine production activities.

- Secondly, the reduction of the governmental budget of the other areas of activities - namely environment, molecular biology, new materials, lasers, industrial nuclear technique applications and nuclear engineering - has demanded a reorganization of the research and development programs in the form of new contracts and informal partnership with other public and international organizations. But, two years after the beginning of such reorganization, it was clear to the top management that the Institute was loosing focus and institutional synergy. It was clear that IPEN was missing adequate managerial instruments to keep the situation under proper control.

- At the end of 1998, IPEN noticed that ABIPTI – a Brazilian Technological Research Institute Association – was organizing a project named Technology Research Excellence Project with the purpose to improve the management practices of their members. This project has a quite simple operational principle: based on the management model of the Brazilian National Quality Award as a reference, IPEN writes a management report reflecting

the managerial practices that are actually being in use in the Institute. The results derived from such practices also have to be reported. Later, experts evaluate this managerial report and come to visit our organization in order to check the practices reported as well as identify others not reported. At the end of this process, the adherence of the managerial practices to management model reference is punctuated (in a scale that varies from 0 to 1000) and an evaluation report is elaborated by the experts, presenting the main strong aspects as well as the improving opportunities that need to be implemented at IPEN. This report presently constitutes one of the main instruments to improve the managerial practices of the Institute.

- In 1998, a new strategic approach was also developed. IPEN created the Technology Business Incubator Center – CIETEC, as a result of a strategic approximation of IPEN with other Research and Teaching Institutions, and the São Paulo Government.

3. The learning management path

In 1997, our main stakeholder - CNEN - initiated a project named "Rethinking CNEN" in order to strategically re-organize the whole Institution. This process, among other things, tried to identify at IPEN some of its main processes. This reorganization process was soon discontinued for unknown reasons, but one of the main tasks that was accomplished, was the formal definition of IPEN´s mission: "Our commitment is with the quality of life of the Brazilian population, producing scientific knowledge, developing technologies, generating products and services and forming human resources in nuclear and related areas". This definition can be considered one of the foundations of a successful route to a real reorganization process initiated by the top managers of IPEN in 1998. The importance of our mission will be discussed some paragraphs later.

At the beginning of the year 1999, IPEN joined the Technology Research Excellence Project organized by ABIPTI. One of the main organizational learning principles on which this project is based is the inter-comparability of results. Up to that moment, Brazil lacked a data base dedicated to evaluate the performance of Research and Technology Institutes. All data available were basically academic performance indicators collected by the Science and Technology Ministry and some fomentation agencies. By joining the project in its beginning, IPEN was able to participate in the construction of the ABIPTI technological data base – and its related common data collecting methodology – and started to learn on how to build such

indicators. This learning opportunity along with this brand new technological data base was crucial for the first Director Plan of IPEN, elaborated in 2000.

In the year of 1999 the first managerial report of IPEN (reflecting activities of 1998) was written. This report was independently evaluated and some structural management problems were identified: lack of structured and continuous planning mechanism, lack of proper information system to manage the knowledge - especially in the field of research and development – absence of practices to evaluate the satisfaction of IPEN's client and absence of practices evaluating the manpower satisfaction level. Departing from this initial evaluation report, new managerial practices are being implemented and are being evaluated, improved and refined, annually.

In the year of 2000, the main improved focus was the establishment of a planning approach and finishing the ISO certification process initiated four years before for the production and commercialization activities in the radiopharmaceuticals area.

A planning effort was reinitiated by IPEN due to the "Rethinking CNEN" Project interruption. A planning tool named Director Plan (DP) was elaborated. This DP is a planning instrument with annual goals aligned to the Brazilian Governmental Annual Planning (PPA) where established goals for a four-year period are defined. Each year the annual goals of DP are reviewed and confronted to the four-year governmental goals. This planning mechanism is still in use and organizes the scientific and technical activities of IPEN in seven programs: Nuclear Techniques Applications, Teaching and Scientific Information, Materials, Environment, Nuclear Reactors, Health and Radiological Safety. Each one of these programs is executed by what we call "Activities".

These Activities can focus up to three technical functions of IPEN (1. Research & Development and Engineering (RDE), 2. Teaching (TEA) and 3. Products and Services (P&S)). These functions were derived from our mission were we can clearly identify these three functions ("producing scientific knowledge, developing technologies" = Research & Development and Engineering function (RDE); "forming human resources" = Teaching (TEA) and "generating products and services" = Products and Services (P&S)).

When the concept of the DP was being elaborated we were, at the same time, learning and developing the ABIPTI's technical database. Due to this experience we could define quantitative indicators for the DP compatible with ABIPTI's technical database. In Table 1, we present some of the main indicators we are presently using to evaluate each of these three technical functions.

Research & Development and Engineering Function	Teaching Function	Products and Services Function
Federal budget	-	Federal budget
Funds of fomentation agencies	-	Funds of fomentation agencies
Other funds sources	-	Other funds sources
Number of...	Number of...	Number of...
Partnerships (national and international)	Finished Scientific undergraduate scholarships	Income
Technologies generated	Ongoing Scientific undergraduate scholarships	Products and services in the official catalogue
Patents at pre-protocol stage (national and international)	Finished master degree post graduate students	Products and services out of the official catalogue
Pending Patents (national and international)	Ongoing master degree post graduate students	Products and services launched in the official catalogue in the year
Patents granted (national and international)	Finished doctorate degree post graduate students	Clients
Papers and publications (national and international)	Ongoing doctorate degree post graduate students	
Technical reports	Post graduate disciplines offered	
	Graduate disciplines offered	

Table 1: main indicators used to evaluate the Activities performance[1]

By the moment the next year DP is elaborated, each Activity establishes qualitative and quantitative goals, according to the strategies established by the coordinator of the Activity. This process starts at the end of the year (immediately after the Seminars organized to present the results of the last year DP) where a draft of the DP is elaborated. After the official budget is authorized (usually at the beginning of the next year) the DP draft is renegotiated by the Top Managers with the Activity coordinators and then concluded.

The DP Seminars also function as a control process of the DP. In these seminars the results of the main goals of the year of each Activity are presented. The presentations are internally peer-evaluated through a structured questionnaire and by a final mark representing the quality of the presentation. The best presentation is granted in the following year with an additional financial support. Beside this qualitative type of evaluation, the Activities are evaluated by three categories of quantitative evaluation: the best result in the teaching function, the best

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[1] In order to evaluate and compare the performance of the Activities within IPEN and externally, using ABIPTI data base, these figures are divided by the number of doctors or by the number of Graduated Professionals and students dedicated to an Activity.

result in the publication effort and the best result in developed technologies. The Activities with best performance in each category are financially awarded. Specific formulas were developed using weights to the different outcomes in terms of publications, technologies generated and teaching effort to identify the benchmarks. Activities with bad evaluation result have a second chance by presenting the Seminar privately to the Top Managers. Depending on this presentation, these Activities may be terminated or incorporated to another one.

In order to improve the quality of the planning process, in the year of 2000, the development of an information system was also initiated. This system – named Planning and Management System of IPEN (SIGEPI, from the Portuguese initial letters) – registers the planned results for the next year as well as the results that were effectively performed in the present year. One of the main merits of the system is the integration of data banks of the different functional supporting areas. This data banking integration decreased the collecting effort needed from the technical areas as well as it increased the quality and quantity of the performance results of IPEN.

Almost at the same time, by participating in the Technology Research Excellence Project, IPEN could learn about the Balanced Scored Card. Thus immediately started to study what a BSC is and then developed its own BSC. The development of the BSC also helped the construction of the SIGEPI by focusing the development of the information system where the data were most needed. More details will be presented in the next block of this article.

In the year of 2002, the evaluators of the managerial report of IPEN from ABIPTI's project, among other improvement suggestions, suggested that the procedures we used to evaluate the organization performance were basically limited to the activities that received the ISO 9000 series certificate. There was clearly a need to establish an evaluation procedure were the whole organization could be strategically analyzed. Besides that, internal evaluations of the managerial reports had earlier detected that comparative information performance were each year surveyed, presented comparatively in the managerial report but were not analyzed and, consequently not used to promote improvement on IPEN's performance. The combination of these suggestions resulted in a totally new procedure developed and put into practice in 2003 named "Global Performance Critical Analysis Report".

One important part of this document is the evaluation of the main performance indicators. These indicators were picked up from among five perspectives of IPEN BSC as presented in the Table 2[2].

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[2] There is a sixth perspective which represents the society perspective. This perspective is not included (yet) in this analysis but it is considered at the level of ISO 9000 certificate.

BSC perspective	Number	Indicator Title
Financial	1	Income
	2	Return of production function income
	3	Fomentation agencies income
	4	Total budget divided by the working force (ABIPTI 113)
Client	5	Satisfaction of the product and services clients
	6	Satisfaction of the R&D clients
	7	Satisfaction of the teaching function clients
Processes (outcomes)	9	Number of technologies developed (608 ABIPTI 608 + 609)
	10	Number of articles published in international indexed journals (ABIPTI 612)
	11	Number of papers presented in international events (ABIPTI 614)
	12	Number of articles published in international and national journals
	13	Number of papers presented in national and international events
	14	Number of dissertations and thesis presented (ABIPTI 634 + 633)
	15	Number of working dissertations and thesis
	16	Number of pending patents (ABIPTI 604)
	17	Number of graduation, post-graduation and post-doc students
Learning and future perspective	8	Organizational Climate
	8A	Indicator IPEN 8A – Number of Suggestions in the Suggestions Program
	18	Number of professionals of IPEN at the post-graduation Program
Correlation analysis among DP Activities	19	Income X Production function
	20	Income from fomentation agencies X Number of doctors
	21	Number of publications X Number of doctors
	22	Number of Master degree students X Number of undergraduate students
	23	Number of points at Technology Research Excellence Project, coordinated by ABIPTI (a management excellence index)

Table 2: performance indicators considered for analysis in the Global Performance Critical Analysis Report.

The analysis of these indicators follow a quite simple structure: each of the 23 indicators are presented with the results of the last three years. Some indicators are related to the number of technical graduate working force, the number of doctors (or the number of the total working force) in order to make the comparison possible. An analysis explaining the tendency is

performed by the staff of the Innovation and Planning Directorate and improvement recommendations for the Top Managers are suggested. Later on, this document is submitted to the Top Managers for analysis, critics and approval and distribution through a summarized paper version and through a full version by Intranet.

In the middle of the last year a novelty within this process was introduced: after the approval of the Top Management, a Seminar reuniting the administrative and technical managers was executed in order to present the main results and recommendation of the Global Performance Critical Analysis Report analysis. At that time the results of some of the main indicators were presented comparing the performance of the different Activities of the DP. The performance and the analysis presented in the Seminar were strongly questioned by the participants because of the quality of the data used to build the analysis. The interesting thing was that these data was extracted from the SIGEPI, the information system used to register the data supplied by the Activities coordinators! It was clear that the information system would need a new upgrade. This upgrade was indeed executed during the second semester of 2004 and, by December, a first on-line Intranet version of the SIGEPI was launched where each Activity coordinator could fill on line, the information about the results of the year 2004 DP and plan the 2005 DP.

At a first glance, the results, in terms of publications, were disappointing: the number of papers, articles, and chapters of books and books has decreased in more than 23%, between 2003 and 2004. What happened? A first analysis of the results of 2004 confirmed something that we knew but couldn't measure with the older system: part of these publications were written with internal co-authors. Thus, many of these publications were counted twice, inflating the real result. With the new version of the system this problem was solved and now we have a real publication figure.

On the other hand, the number of technologies has increased more than 21%. What may have happened? Probably, this result is explained by the improved condition to report these results and due to a better comprehension of the concepts behind this performance indicator.

The fact is that it is quite clear now for the Top Managers that a new standard of information management quality has been reached at IPEN. A long list of benefits can now be presented: The quality of the planning and performance evaluation has strongly improved. The new information system improved the internal transparency; the managerial concepts and indicators were better understood and more uniformly disseminated within the organization; the capabilities to know what each technical team is doing are much better. Also it has

improved the control of how much each team is spending and on what; what results they are generating; which are the best teams and which need to improve its performance can be easily identified. This new version has actually simplified the data collecting by really integrating different staff areas but, maybe, the most important benefit was that this information system has gained the trust of the middle managers and of the scientific community. Now we are beginning to have available a real knowledge management tool. A new level of management learning capability is beginning.

Unfortunately the implementation of "the whole" history was not easy and "nice". In the next block the evaluation of this information system is detailed.

3.1 The evolution in the management information systems

Up to the year 1998, the "tool" that the Top Management used to collect the performance data and to control what each technical area and professionals did in a specific year were basically reports. These reports were usually formally and sometimes informally requested by telephone call. There was a special formal report named "annual individual activity report (RIA, from the Portuguese initial letters)". This type of report was requested only from the technically graduated professionals. At that time, each year, more than 500 of these reports were written. There is no need to say that the use of such reporting system was almost useless: virtually no one read it.

Besides that, there was another serious problem with the information system as a whole. IPEN has many stakeholders – Science and Technology Ministry (MCT), Nuclear Energy National Committee (CNEN), Sao Paulo State S&T Bureau (SCTDET) and funds agencies. Basically, all of them required IPEN's performance reports, anually. Unfortunately these stakeholders used to request these reports at different moments in a year and frequently involving some differences in the information that was requested. Therefore, each time a new report was demanded, there was a need to ask the middle level managers and the scientific community to update the information previously requested. Frequently, due to the mail services or due to long hierarchical lines, the time available to prepare the report was very short. In consequence, the pressure for retrieving the answer was high and many times the figures had to be quickly estimated. On the other hand, when there was time enough to answer, a more precise figure meant asking again the scientific community, sometimes with additional specificities but, in general terms, with the same information. Of course, such re-requirements

used to let them angry. The final result of such information mess was that IPEN was loosing the notion of its real performance and thus the proper means to manage its own technical activities.

In 1999, a committee reporting directly to the Superintendence was nominated to write the first management report of IPEN for Technology Research Excellence Project organized by ABIPTI. It was clear that there was a need to improve the process to register the results of IPEN performance because all results would need to be proved, in case of an external evaluation.

The first move to improve the quality of the information system of the technical areas was the development of a WEB version of the annual individual activity report (RIA), now considering the information needed to fill the technical ABIPTI data bank. The new RIA was named RIA II and the proposal of this system was presented to the top management by the staff directly responsible for the collecting and reporting information about IPEN (at that time this staff was an advisory body reporting directly to the Superintendence; later on this staff became the Innovation and Planning Directorate). Unexpectedly, the proposal was rejected based on the argument that the whole performance of an Institution like IPEN cannot be based only on adding individual performances. Almost one year of work on this subject was lost but, at least, one lesson was learned: the main function of an organizational information system is to help the organization to plan and evaluate its activities from a top-down perspective and not from a bottom-up perspective, as it was initially proposed.

The need to built a quick information system, drove us to build an EXCEL-type data file sheet were we could easily centralize the main performance results accomplished of the whole organization in one year (involving, for instance, the human resources information, the financial results and the three technical functions (RDE, TEA and P&S)). Such "information system" had many limitations – still there was a need to ask the information for the staff areas (finance, commercial, human resources, teaching supporting area and the technical areas) but through this data sheet we did the first important step toward an integrated system by identifying the type of information available and where they came from.

In the next year (2000), the implementation of the first DP reinforced the need to build an information system to manage the technical areas. The information was collected using a framework of selected indicators (earlier mentioned) structured in a standard Power Point presentation. Thus, by filling these Power Point presentations, the Activities coordinators were communicating what they were planning to do in the next year. In other words, the Power Points files were the information system!

The following step was the design of a system where the information about some staff areas would be made available through IPEN data network. The selection of these areas considered the BSC recently developed to help the management of the organization as a whole. The information system was also designed to help the elaboration of the DP as well as to make the survey of the results easier concerning this DP . Thus this system was named Managerial and Planning Information System of IPEN (SIGEPI).

This first "real" information system was built using the ACCESS software (MICROSOFT OFFICE). This software was chosen basically because of the following reasons: 1.it is easy to be learned; 2. no availability of skilled personnel from the software programming staff and 3. it is easy to be modified when improvements are needed. Every professional from IPEN would have the right to access the system and the responsible for the different information blocks would be able to manage their part in the system. Unexpected technical difficulties arose with the IPEN data network limiting the accessibility of the system. Due to this problem only few staff areas were able to use the system (events and visits control, national training courses control) and some of the Innovation and Planning Directorate activities (patent information control, international travels control and formal partnership); almost no technical area was in condition to access the system. The consequences of these difficulties were somehow devastating: 1. lack of confidence by the technical areas in the system, 2. the need to still collect the DP in the form of Power Point presentations (2001) or detailed paper forms (2002-2003) 3. low quality of the data received from the Activities coordinators and 4. overload and stress for the professionals of Innovation and Planning Directorate due to the need to type in the system the whole information of the DP (planned and executed).

Finally, in the second semester of 2004, a new story began. The old SIGEPI was "translated" into a new language (SQL Server) and using the CGI-Delphi client-server language. Near the end of the software programming effort, a Seminar was conducted in order to present the system for the Activities coordinators and to explain them how the system would work.

One interesting feature of the system is the generation of the Power Point presentations. Now the information system generates the presentation (on the contrary of the very beginning of this whole process where the presentations were the information system). This new SIGEPI version runs an interface with the information system of the following "local" systems: finance, commercial, human resources, teaching supporting area. The new system also allows the coordinator of an Activity of the DP to follow the status of patent required by someone from the Activity he coordinates.

Unfortunately the basic features of the new system were concluded only two weeks before the DP Seminars. Because of this, few days were left to the coordinator to fill the new system. When the data filling process began two serious problems happened: firstly, despite some pilot tests were performed, when the coordinators started to type their data (there were 35 coordinators) and, simultaneously, each technical professional inserted their publications in the system, the server became overloaded and crashed; secondly: the data concerning the undergraduate and post-graduate students were outdated. Conclusion: a lot of complaints and pressure to postpone the implementation of the system. Although the high pressure, the problems were solved in few days and the system was successfully installed.

4. The incubator path

In 1997, meanwhile IPEN was developing its own strategic planning, IPEN´s top managers received the visit of the President of the São Paulo section of the SEBRAE - a non-governamental organization whose purpose is to provide support for small and medium enterprises - with a totally new and unknown proposal for IPEN: to create an incubator center for technology-based companies.

This idea matched perfectly with the need of IPEN to get closer to the society, and their needs, after almost 40 years dedicated to one client – the Government – as mentioned earlier. Immediately after this visit, the Superintendent nominated two directors to study and develop a project based on this idea.

Since the beginning, it was clear that IPEN would need to look for partners to implement such undertaking. The two obvious technical partners where those located within the same neighborhood of IPEN: IPT (Technology Research Institute) – the largest technology research institute in Brazil and USP (University of São Paulo) – the most important university of Brazil. The alliance with these two organizations could also provide an important experience in field of the implementation of an incubator: both organizations had earlier tried and failed to implement such undertaking.

Within the time span of one year, the first project of the incubator was elaborated and submitted to SEBRAE/SP. This project included the statute of this venture, the proposal of the

first public announcement for the call of candidates and the financial resources needed to refurbish a building (for partial use – near 1,200 m^2) at IPEN campus (near U$ 100,000).

Yet in 1997, the project was approved and with the help of IPEN researchers the CIETEC was founded as a civil non-profit organization in April 1997. A deliberative board was organized. The Presidency was occupied by the Superintendent of IPEN and the Manager was selected from the private sector. In order to manage the incubator, at the very beginning the manager was invited to work under a "risk agreement": he would be contracted if the undertaking were successful. This meant that for the initial months of the structuring process of the CIETEC this manager worked without any income from any partner. The Deliberative Board was established with two representatives of the five partners: IPT, USP, IPEN, SEBRAE, SCTDET (science and technology, economic development and tourism bureau of the State of São Paulo). Three years later the MCT joined the Deliberative Board.

In May 1998 the first public call for candidates was published. 31 proposals were presented and 7 of these proposals were approved. The second public announcement was called in November 1998. 41 proposals were submitted and 9 were approved. These initial results confirmed that there was an unexplored potential for such kind of undertaking.

In 2000, the member of the Board, the manager and other collaborators of CIETEC initiated an effort to increase the physical area of the incubator center. The idea was not to propose a "linear and conventional" incubator expanding project but to implement a new paradigm of an incubator center where the results could mean a starting point for a significant impact in the regional and local development (social and economic). The proposal included the multiplication of the size by three and the inclusion of new types of technological organization, like software organization, as well as the incubation of start-up projects (mainly spin-offs from Research Institutes and Labs of the Universities). New financial sources where searched and, despite some initial skepticism, the funds were approved and allocated (approximately U$ 500,000). Table 3 show figures of this new stage.

The CIETEC's services provided for the incubated companies are:

- Experience Mentorship;

- Supporting the proposal for funding request at governmental and non governmental financial supporting organizations (innovation agencies, research foundations);
- Easy access to information and technological services;
- Shared infra-structure facilities;
- Training courses on management;
- Support for marketing processes;
- Easy access to SEBRAE consultancy services.

Number of…	1998	1999	2000	2001	2002	2003	2004
…candidates	72	0	91	90	37	109	58
…approved candidates	15	1	0	44	42	49	33
… jobs created	n.a.[3]	n.a.	n.a.	203	324	458	546
…income of the incubated companies[4] (US x 1000)		85	404	1535	2330	5419	7749
…income tax[4] (US x 1000)		17	81	308	465	1081	1554
…articles published in the written media	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	203
…articles published on the radio or TV	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	18

Table 3: some CIETEC indicators performance

Source: CIETEC

5. Main benefits

5.1 From the management path

The development of the Director Plan was a very important step to the establishment of a culture of knowledge, a planning culture and to generate goals commitment in the organization. Additionally, the evaluation of the results based on internally and externally intercomparable indicators has set the conditions to the individual and institutional performance improvement.

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[3] Not available.

[4] Values are approximate and were calculated for a exchange rate of 1,00 U$ equals R$ 3,00.

The Director Plan Seminars, coupled to trustable data systems, are helping to build internal synergy, improving the knowledge of IPEN's competence and as well as uncovering explicit knowledge.

The external impact of the new strategic plan and management procedures of IPEN, according to the regional public policies for social and economic development, mainly in the State of São Paulo, the IPEN and its partners conduct the operation of the CIETEC Incubator Center to stimulate quality gains and competitiveness by incorporating technology to the productive process of the micro, small and medium-size companies, which stand for great employment generators.

5.2 From the incubator path

The success of the Incubator Center has represented for IPEN and the other partners a new way to give support for the regional economic and technological development.

For IPEN the CIETEC meant also a special opportunity to show the society its internal technological capability as well as the existence of new possibilities to apply and expand the application of knowledge developed in the nuclear and correlate areas and to work closer to important partners like USP and IPT.

6. Recommendations for dissemination of the experience

The adoptions by public research institutes of management models based on the excellence presents complexities during its implementation period. The results, though, are encouraging. One of the main difficulties faced by IPEN refers to the highly technical and lack of managerial experience of the management body of the Institution. However there is still a need to improve the managerial skills of the manpower.

Other aspects that need to be improved are the incentive mechanisms for successful individuals and groups. In spite of these kinds of problems, IPEN has experienced impressive improvement in its managerial and knowledge competence.

The experience developed concerning the relations between research institutes/university-industry-government in the form of an Incubator Center for Technology-Based Companies-

which is presently expanding to the Technology Park of Sao Paulo - can also be used as benchmark for other organizations.

Both learning experiences – improvement of the managerial capability by using an excellence management model and the experience of the Incubator Center - can be considered benchmark for other R&D organizations.

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