**Artigo Científico – Conheça os modelos de transferência de tecnologia existentes no Brasil**

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**Models for technology transfer in Brazil**

The models adopted for transferring technology from universities and research centers to industry are reviewed and analyzed critically with identification of their main shortcomings, particularly for the Brazilian case.

**Partnerships of research institutes and universities with companies**

A model of technology transfer widely used in several European countries and in North America involves partnership between research institutes and universities and companies. This also applies to Brazil, where some initiatives are prominent. One of them is the Disque [Tecnologia](http://www.planodenegocios.com.br/www/index.php/informcao/artigos-cientificos/2947-conheca-os-modelos-de-transferencia-de-tecnologia-existentes-no-brasil) (Revista de Administração, FEA/USP 1999) of the University of São Paulo (USP), which is devoted to help small companies solve problems that do not require new developments in high technology, from the academic point of view, but nevertheless lead to optimization of processes and products that could not be performed by the company on its own. The success of this program lies perhaps in the strong participation of several junior enterprises run by undergraduate students of USP, for they serve as connective agents between academy and the companies. When in conjunction with programs such as the SEBRAEtec of SEBRAE-SP (SEBRAEtec 1998), which cover part of the costs of consultancy work, Disque Tecnologia becomes a low-cost manner to solve technological problems that small companies can afford. Note that this model involves several actors: researchers, with their expertise; companies seeking solutions for their problems; junior enterprises as catalyzing agents for the whole technological transfer process, and SEBRAE-SP contributing with financial resources.

In administrative terms, technology transfer from Brazilian public universities to the private sector is done via specific foundations, usually associated and run by academics, in spite of their independent nature as far as juridical aspects are concerned. Even though some foundations are extremely agile, allowing transfer in a seamlessly way, they usually assume a passive role towards the whole transfer process, in that the foundations only help researchers who already have partners for their innovation. An active role is lacking, through which foundations would help selling ideas and/or seek the most appropriate partners, or even identify prospective research results that could be turned into products or processes. In summary, the academics end up having to develop the innovation and lead the transfer process, which obviously represents an overburden. We advocate that the bodies responsible for technology transfer on behalf of universities and research centers – may they be foundations or not - should be equipped with expertise for identification of projects amenable to technological transfer and of opportunities in technological improvements for varied companies, in addition to marketing and juridical issues. In summary, such bodies should rely on work by experts in technology transfer, a type of professional whose profile we discuss in Section 3.

There are also research institutes associated with universities, but with independent administration, which develop technology-oriented research. This is the case of theInstituto de Pesquisas Tecnológicas (IPT), located in one of the campuses of USP, which has strong ties with the private sector. Also worth mentioning are the various units of Embrapa (*[Empresa](http://www.planodenegocios.com.br/www/index.php/informcao/artigos-cientificos/2947-conheca-os-modelos-de-transferencia-de-tecnologia-existentes-no-brasil)*Brasileira de Pesquisas Agropecuárias), which have over the years developed new products and instrumentation for the agribusiness.

**Parks and technology centers**

The parks and technological centers or "science parks", as they are known, appeared in the late 1940s, in Palo Alto, near University of Stanford, where the atmosphere was favorable for the companies to access technology generated in the University. Later, other North American universities also implemented their technological centers, such as the Route 128, near MIT - Massachusetts Institute of Technology. Those experiences motivated other countries to create their regional technology parks, trying to generate jobs through promoting technological development (Torkomian 1992). Essential requirements for a successful technological center include (obviously) the interaction between university and industry to promote innovation and technology transfer, but the availability of venture capital is also of paramount importance. Without such capital, it is impracticable for companies of technological base to venture in highly innovative projects that demand large investments. These companies are special because they are run by entrepreneurs that value continuous innovation, aware of their high risk of failure, differently from companies dealing with a [more](http://www.planodenegocios.com.br/www/index.php/informcao/artigos-cientificos/2947-conheca-os-modelos-de-transferencia-de-tecnologia-existentes-no-brasil) conservative environment. For example, Gibb apudTorkomian (1992) takes the view that communication channels should be established between science parks and companies, probably through industrial clubs, in addition to informing the population about the positive impact that the technological park may bring to the region. The governmental participation is also essential, not only to help finance initiatives, but also to offer guidelines for research efforts to be directed toward sectors considered as priority, as it happened in the USA. Science parks have also been created outside USA, in Canada, Germany, Italy and England (Dalton 1987). In Japan, in particular, technological cities, the technopoles, were created in medium size cities, with excellent infrastructure. This model was also adopted in France, with technolopoles near Paris and Lyon (Medeiros et al.1992).

In Brazil, technological parks appeared in 1984, as a result from agreements between CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico) and institutions located in São Carlos-SP, Joinvile-SC, Campina Grande-PB, Manaus-AM and Santa Maria-RS, with the aim of generating technology-based companies (Medeiros et al.1992). There are now dozens of parks across the country. The case of São Carlos-SP is singular. The city has ca. 180,000 inhabitants and hosts 2 public universities: a campus of USP - University of São Paulo, and UFSCar - Federal University of São Carlos, both with prominent research in hard sciences and engineering. In addition, the city also hosts two units of Embrapa. With such a favorable atmosphere, several technology-based companies developed which also took advantage of tax rebates offered by the local Government. Several cases of success companies could be listed, but one must acknowledge that the rate of consolidated companies, 15 years after the establishment of the park, is below that of other countries. This is also true of other science parks in Brazil. Perhaps the main cause for the performance below expectation lies in the absence of two already mentioned essential requirements for consolidation of technology-based companies: venture capital and flexible and entrepreneurial administration of businesses. With rare exceptions, there is no tradition of venture capital in this country. Investors are not attracted to high-risk projects, particularly because the high inflation rates that prevailed for decades and the present high interest rates have provided a handsome return for investments with almost zero risk.

Another difficulty faced by companies generated within science parks arises from the fact that they are normally run by former researchers or just-graduated students that are not prepared to run a business, in spite of their talent for technological innovation. These professionals may have not been trained for market-driven activities, and therefore lack background on fundamental concepts of administration, such as planning, market analysis and assessment of economic viability of a business. Other critical factors for consolidation of technological parks are identified in the analysis of theories of regional development (Spolidoro 1999), according to which some basic premises for the success of a park include:

1. The park must be part of a strategic plan of regional development, which should have a long-term perspective;
2. The formulation and implementation of the regional project for the future should be made by a permanent and independent organization, and

1. Synergism should exist between the several agents of society, such as government, universities, companies etc, forming a forum of discussion of the future project in a public sphere, regardless of political parties.

In spite of the problems mentioned, a lot has been done and perhaps the most difficult goal has already been achieved, namely the establishment of technological parks and the belief on the part of society of its importance. It is necessary now to promote programs that may meet the needs identified, for instance seeking to attract venture capital, and aiming at qualifying entrepreneurs to manage high-technology businesses.

**Incubators of technology-based companies**

With the advent of technological parks, the concept of incubators of technology-based companies arose naturally. The business incubators are aimed at supporting start-up companies in certain areas of business. A business incubator is a flexible environment where means are offered for the appearance and growth of new enterprises (AMPROTEC 1998). In addition to consultancy in technical and managerial administration of the company, the incubator may offer shared services such as laboratories, telephone, internet, fax, telex, photocopies, mail, water, safety systems, and rent of physical areas. Thus, a business incubator is a mechanism - maintained by government entities, universities, community groups etc – for helping the development of companies (incubated or associated) through offering services and technical support, in addition to practical and professional orientation. The main objective of a business incubator is to breed successful, economically viable companies that are competitive in their market, even after they leave the incubator, generally within a period of two or three years.

The number of incubators has increased rapidly over the last years. In the USA, until the early 1980s there were only about 10 incubators, but this number exceeded 500 in 1997 (Rice and Matthews 1995; Business Incubation Works 1997). Such incubators are widely varied, involving technology-based companies or conventional companies, or even a mixture of both. In Brazil, a similar phenomenon occurred recently. The first business incubator was established in São Carlos-SP, in 1984, linked to the [Fundação](http://www.planodenegocios.com.br/www/index.php/informcao/artigos-cientificos/2947-conheca-os-modelos-de-transferencia-de-tecnologia-existentes-no-brasil) Parque de Alta Tecnologia de São Carlos, stakeholder of the incubator. Since then, the number of business incubators in the country increased considerably. Today, there are over one hundred incubators, and the rate of creation is approximately one per month, which is the highest rate in the world. In the State of São Paulo, there are ca. 40 business incubators, i.e. approximately 40% of the country’s total. The high rate, especially in the State of São Paulo, has been motivated by the financing of new initiatives by SEBRAE-SP and FIESP (Federação das Indústrias do Estado de São Paulo).

Business incubators are agents for economical development, in addition to participants in the formation of entrepreneurs and companies. Economic development based on technological innovation depends on four critical factors (Smilor and Gill 1986).

1. Talent – People;
2. Technology – Ideas;
3. Capital – Resources, and
4. Know-how – Knowledge.

According to Dertouzos (1999), technological innovation has four pillars, which are consistent with the factors mentioned above.

1. Venture capital investment;
2. Infrastructure for high technology;
3. Creative ideas, and
4. An entrepreneur culture focused in the passion for business.

Still according to Dertouzos, those four ingredients are rare, particularly because in his view passion for business comes first and the money later. This contradicts current conceptions of economical analysis, which put a consuming market and profit possibilities as the cornerstones for planning a business. Dertouzos (1999) concludes stating that technological inventions normally do not happen like this. Instead, the companies look for innovative technologies to improve or develop new products in research centers, while the latter develop technologies without economical analysis, which may be or may be not viable commercially later on. It is clear, therefore, that business incubators of technological base have a role to play in bridging the gap between innovation in research centers and the actual application in companies with commercialization of products and services. They can be a place of convergence of interests of innovators and entrepreneurs, providing an “overdose” of technological innovation based on which technology-based companies may prosper.

**Use of fiscal incentives and special programs in Brazil**

The mechanisms to foster industrial technological research in Brazil are the subject of Law 8284/91 (for information technology) and Law 8.661/93 (for Technological and Industrial Development). Law 8.248, dated from October 1991, regulates training and competitiveness of the computer-related industry and automation, whose main benefits to companies are the fiscal incentives. To be eligible for such incentives, companies should invest 5% of their revenue in research and development (R&D), at least 2% of which should be invested in joint projects with Universities and Research Centers, or in priority programs defined by the Ministry for Science and Technology - MCT. The fiscal incentives include rebate of up to 50% of the income tax in a fiscal year with expenses in projects of P&D, and exemption of the industrialized products tax (IPI) upon purchases of machines and equipment, produced in the country, to be employed in R&D projects. According to MCT, the new policies for the computer industry are based on partnerships between industry, university, government and society. Still according to MCT (www.mct.gov.br), more than 250 companies have benefited from Law 8248, with fiscal incentives of ca. 250 million dollars per year.

**Programs of technological innovation**

#### MCT PROGRAMS

Created by the Brazilian Government in 1984, the PADCT program (Programa de Apoio ao Desenvolvimento Científico e Tecnológico) has an inductive role to foster R&D in areas considered as priority. PADCT is financed by the World Bank, with counterpart money from the Brazilian Federal Government's budget. Besides fomenting applied research projects in which technology transfer is not compulsory, PADCT created modules to directly support companies that wish to invest in R&D. Two examples of the last round of PADCTIII were the modules of platforms and the specific cooperative projects. With the platforms, R&D consortia should be established for identification of technological gaps in a given sectors, which is to be followed by definition of actions to bridge them. In the specific cooperative projects, partnerships were established between companies and universities or research centers in order to develop or enhance products, processes or technological services. Within this module, for instance, a partnership between Itautec/Philco and NILC (Núcleo Interinstitucional de Lingüística Computacional), with the participation of two authors of this paper, is being financed to enhance a grammar checker for Brazilian Portuguese (Martins et al. 1998).

#### FAPESP PROGRAMS

For more than three decades, FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo) refrained from fomenting technological projects. This was altered in the 1990s, with the implementation of specific programs, such as the Program of Partnership for Technological Innovation (PITE) and the Program of Technological Innovation in Small Companies (PIPE) (FAPESP 1999). PITE started in 1994, with the aim of financing innovation projects in the productive sector, in partnerships with research institutions and companies from the State of São Paulo. FAPESP finances the project fraction under responsibility of the research institution, while the company must contribute with its counterpart. Approximately one hundred projects have been supported. There are three modalities for this type of project, depending on the stage of development of the innovation. For Modality 1, in which the technological viability of the innovation is practically ensured, FAPESP finances up to 20% of the total value of the project. In Modality 2 are included projects for incremental innovation, generally forced by the market, where FAPESP finances up to 50% of the total cost of the project. Projects with high technological risk but promising potential for impact on an activity sector are classified in Modality 3, where FAPESP may finance up to 70% of the total cost of the project.

The program designed to help small companies, PIPE, started in 1997, in which support is given for research aimed at technological innovation directly in the company. The researcher responsible for the project may be employed by or indirectly related to the company, which should not have more than 100 employees to be eligible. The objective is to motivate such companies to invest in research of new high technology products or innovative processes, which can increase their competitiveness. The risk of innovation projects in small companies is certainly much higher, and owing to this specificity PIPE contemplates three phases. In the first, which lasts six months, the company must demonstrate the feasibility of the innovation, and for that FAPESP offers up to R$ 50,000. Projects that are evaluated positively in this first phase can apply for resources for the second phase. Research in this phase must be completed within 24 months, for which the company may get up to R$ 200,000 from FAPESP for the actual development of the technological innovation. Phase III is dedicated to the development of new products or processes, based on the research carried out in the two previous phases. Although FAPESP provides no financial support at this stage, it still helps the small company to find additional funding sources, such as financing through public programs.

#### SOFTEX PROGRAM

Softex 2000 (Programa Nacional de Software para Exportação) was launched in 1993 by CNPq “as a decisive contribution for the change of focus of Brazilian computer science industry: from hardware to software; from the domestic market to the international market; from the production and distribution in small scale to a large scale" (SOFTEX 2000). In 1994, Softex 2000 was considered priority by MCT with fiscal incentives offered to the companies through Law 8.248/91. The Program was initially run directly by the Federal government but at the end of 1996, a non-governmental organization was created to administer it. In connection with the Program, the so-called GENESIS centers were linked to twenty regional Softex nuclei. The mission of such Centers is to support entrepreneurship activities associated with software, by stimulating introduction of courses in universities dedicated to teaching issues that are relevant to the generation of new software companies (start-ups). Students from computer science and correlated areas may then develop start-up companies, for which they receive support in several ways. For instance, the GENESIS Center provides them with infrastructure with laboratories and software development tools; means for incubation of software companies, technical, managerial and marketing support, seed money, and grants for attending fairs and other events in the country and abroad.

#### RHAE PROGRAM

RHAE (Programa de Capacitação de Recursos Humanos para Atividades Estratégicas) is an initiative of the Ministry for Science and Technology (MCT) to improve the competitiveness of National companies in the world market through training of human resources. Its two basic goals are the amplification and consolidation of the Brazilian technological base in strategic areas that identified and selected by the Government. RHAE Projects may be classified into two groups: 1) Research, Development and Engineering (RD&E) seeking the technological innovation and improvement of products and processes and 2) Amplification, improvement and consolidation of infrastructure for technological services, where each class is further divided into distinct categories (RHAE 1999). RHAE supports research projects and technological development with potential socioeconomic impact, especially those arising from incorporation (and/or generation) of scientific knowledge. Such projects should demonstrate capacity to generate, absorb, diffuse and introduce technological innovations or to contribute for expansion in the infrastructure of technological services in the Country. In RHAE financial support is provided via grants for training personnel (preferably associated with technology-based companies) at universities or research centers in technology-driven projects, which usually involve partnerships between academy and industry.

###### SEBRAEtec and PATME (SEBRAE) Programs

SEBRAEtec is a technological consulting service that seeks to supply solutions for specific problems of small companies, by establishing mechanisms that make know-how available to such companies (SEBRAEtec 1998). The problems addressed are generally simple, for which consulting typically does not exceed 20 hours. This limitation in the number of hours of consultancy is perhaps the most important shortcoming of this program. Clients of SEBRAEtec are varied, for they include companies dealing with commerce, industry, services and even rural companies. Other clients include entrepreneurs in the final phase of definition of their enterprises and also informal companies. The PATME Program, on the other hand, provides technological consulting for innovation in the company, to improve either products or processes, instead of a simple solution of specific problems (as in the case of SEBRAEtec). PATME is also focused on studies of technical and economic viability of products or processes, training of human resources, and implementation of quality control.

# ****The multidisciplinary nature of technology transfer****

One frequent misconception in the academic community is that an outstanding technological innovation can automatically be transformed into products, i.e. with effective technology transfer. Such a perspective would circumscribe technological innovations within their own scientific area or sector of economical activity. This could mislead people into believing that generating a product can always be done entirely by experts of the specific technological area. Indeed, technological enterprises often arise from such a perspective, where the company – small as it may be – deals with the whole cycle from innovation to marketing, relying only on experts from the area of the innovation. Effective technology transfer, however, may require much more than implementing procedures to obtain products out of an innovation. First of all, marketing aspects must be taken into account, as concepts such as a business plan for any enterprise may not be fully realized by emerging companies of high technology. The confidence on the quality and technological viability of the innovation, which sometimes is well founded, may prevent entrepreneurs from taking basic steps of a company’s administration. The need to accrue marketing aspects into the actual implementation of the innovation points to the multidisciplinary nature of technology transfer, even in cases where such innovation belongs to a very specific field. It is important, therefore, that a multidisciplinary team be in charge of the transfer, with professionals of distinct abilities being responsible for the distinct stages of the cycle.

Before putting forward proposals to improve transfer mechanisms it may be fit to discuss the reasons why good ideas, i.e. potential technological innovations, fail. Here, such reasons must be discussed according to the type of strategy employed for transfer. When the innovator interacts with a company for transfer, failure may be attributed to several reasons:

1. The innovator did not sell the idea well;
2. He/She did not approach the company of the right size (too large or too small);
3. He/She approached the correct company, but talked to the wrong people (usually technical people with little decision-making power).

When transfer is to be carried with a new business, the innovator may run into a variety of problems, such as:

1. He/She had no idea of the need of a business plan;
2. He/She had no experience in running a business;
3. He/She did not have the required financial resources to invest;
4. He/She did not consider marketing aspects adequately.

In order to avoid some of such problems, any transfer of technological innovation should start with a careful market analysis, where the demand for the final product/service is assessed in order to estimate the financial return for the investment. This is adequately done by elaborating a Business Plan, which provides a strategic target to the business, giving special attention to marketing and financial analysis (Dornelas 2000). Issues to be considered include: market for consumption of the product; competitors in that market; potential growth of the market on the basis of recent performance; marketing plan by the company that will commercialize the product. Having considered these aspects, one may finally assess the prospects of when return for the investment is to be obtained. Sound decisions can then be made into the ways the technological innovation is to be implemented, thus reducing the risk of failure.

**New proposals for Effective Transfer**

The programs mentioned in Section 1 demonstrate that the Brazilian government, funding agencies and entities associated with industry are aware of the importance of technological innovation and transfer. To illustrate, prizes have been conceived to award individuals and/or institutions that contribute with outstanding technological innovation, such as the Alcatel Prize (www.premioalcatel.com.br) for innovation in information technology. Furthermore, Brazilian universities are willing to participate of R&D projects, and some of them have actually instituted bodies to deal specifically with transfer. As a consequence, numerous examples of successful cases of transfer in various areas of technology, including information technology, could be listed. For instance, the Computer Science Department of PUC - Rio de Janeiro has a long-standing collaboration with industries and companies, which have generated innovative processes and products. A representative example of technology transfer has been the whole body of technology for prospecting and exploring oil in sea deep waters, which demanded research within various cooperation programs involving universities in addition to Petrobras’s (the Brazilian oil company) own research efforts.

Nevertheless, when the results are assessed in comparison to what has been achieved in industrialized countries (e.g. USA, Western European countries and Japan, or even Korea), one concludes that technology transfer in Brazil is still at an embryonic stage. The number of patents filed by Brazilian individuals or institutions is extremely small, compared to the total of patents filed in USA, for example. If the number of patents is taken as correlated with technological production, we see that Brazilian technology has not kept with the pace of growth of Brazilian science in the last decades. It is true that the Brazilian scientific system is still very small, where the “density” of scientists is much smaller than in industrialized countries by any standards, i.e. the ratio between the number of Brazilian scientists and the population or the gross domestic product (GDP) leads to figures that are well below those of industrialized countries. The inevitable conclusion from comparison between data for scientific and technological output is that the Brazilian scientific system should still be a basis for a stronger output in terms of technology. There is therefore room for improvement, but this requires more efficient transfer.

Any diagnostics of possible shortcomings in the policies for transfer adopted in this country, even a non-systematic one as made here, is likely to point to at least some of the following problems:

1. Lack of continuity in some of the Programs mentioned. For instance, PADCT has recently suffered from budget cuts and implementation of new projects has been temporarily discontinued. This lack of continuity is “perverse” to the whole system of innovation and technology transfer not only because it badly affects ongoing projects but also because it helps prevent a culture of innovation leading to technology from being established. In other words, the lack of continuity has a negative effect on the attempts to create a virtuous circle, through which synergetic interaction between research and development is favored;

1. Lack of venture capital and difficulties faced by Brazilian companies in producing technology that is viable economically in spite of the severe constraints imposed by prevailing high interest rates and high taxes. In summary, these difficulties mean that Brazilian companies are seldom competitive for investing in R&D;

1. Lack of information about fiscal incentives and innovation programs.

These three limitations can only be minimized with government action and participation of society at various levels. There are nevertheless other severe problems that are closely associated with the models adopted for transfer, upon which we shall dwell to make proposals to improve the system as a whole. Some programs are based on international successful experiences that may not be replicable in Brazil. Let us consider, for the sake of illustration, the Softex Program devoted to small software companies. The financial resources are “pulverized” among a large number of small companies that are seldom capable of competing in international markets (aim of the program!) on their own. Needless to say, producing competitive software is a high technology endeavor. Unlike American companies, for which similar programs were very effective, Brazilian small companies have no easy access to state-of-the-art technology and are not close to large markets. Producing software for export would require integrated efforts from companies as well as high technology developers (which in Brazil are primarily universities and research institutes).

Programs other than Softex also need concerted action, because similar barriers appear for companies to be competitive. We therefore advocate that inductive programs should be extended, with an integrated character. A beautiful example of an integrated effort, albeit not directly related to technology transfer, was the Genoma Project implemented by FAPESP, which involved researchers from more than 20 institutions and achieved unprecedented results. A key factor in this concerted action is to create an effective link between academy and industry, for which we propose the training of professions in technology transfer, as discussed later.

In order to meet the demands outlined above, the Brazilian technology transfer system should be critically assessed to guide a reshaping. This could be done by, first of all, reevaluating Programs that were based on international experiences. Such programs should be adapted to the profile of Brazilian entrepreneurs and the target markets. Existing needs from industry should be identified, with new partnerships between research centers being forged in order to make Brazilian companies competitive. Another cornerstone of our proposal is the urgent need to improve communication between academy and industry, which may be done with massive publicity of programs for technological innovation and transfer. A recent survey by FIESP (Revista de Administração, FEA/USP 1999) showed that 77% of the companies were not aware of technological transfer programs and fiscal rebate possibilities for investments on technology. There are also myths that must be tackled, from which we highlight two. First, most company executives and businessmen believe that research in universities and research institutes are too “ethereal” to be of any practical value and that academics would not be prepared to focus on technological issues required for transfer. Second, academics hold a widespread view that the Brazilian industry is not prepared to invest in technological innovation. While there is some truth in both arguments, recent examples of successful partnerships between universities and private sectors have demonstrated the feasibility of technology transfer. Moreover, university leaders and the Brazilian funding agencies have fully realized the importance of such partnerships and instruments have been created to foster technology transfer initiatives. For addressing these two communities, we advocate that academics must be convinced that in well-conceived projects the research and development (R&D) activities may benefit their fundamental research hugely. As for the industry community, we believe that they must be convinced that investing in technology may be the only route to follow if their business is to be competitive in a globallized economy.

Within the multidisciplinary perspective advocated in this paper, there is at least one important missing link for effectively bridging the gap between technological innovation and transfer: the lack of skilled professionals that could be devoted entirely to identifying and solving the problems faced by those in charge of partnerships. We suggest that professionals should be trained, whose job would be to promote these partnerships. Such professionals should have a reasonable background on administration, marketing and on the ways a given type of industry works, and at the same time be aware of the recent developments in technology of given fields. In summary, they should be trained to acquire the following skills:

1. To be able to assess economic viability of high technology enterprises, and be familiarized with concepts such as payback and internal rate of return;
2. Learn of the life cycle of high tech products;
3. Be aware of legislation associated with patents and financial support to technological innovation and technology transfer;
4. Be able to identify marketing needs and search for related technological innovations, and vice-versa.

To our knowledge there is no post-graduate course or special program devoted to forming this type of professional. While we recognize that professionals with such a profile already exist, they tend to be experienced people who have acquired this expertise over many years. Moreover, their experience is not being shared in any systematic way.

A program that induces formation of skilled professionals with expertise in technology transfer would therefore bring a number of welcome features. The foremost one is the attempt to bridge the gap between technological innovation and effective transfer. As byproduct we could mention the feedback to the academic community, which would help in revising curricula in order to make the university courses closer to the demand from industry. In this context, we believe that any initiative in technology transfer should make use of the Brazilian post-graduate system that has been developed over the last 30 years and has reached maturity, in spite of its size - which is much smaller than expected for the Brazilian population and gross domestic product (GDP).

**Conclusions**

In this paper we have advocated a reassessment of existing Programs for technology transfer in Brazil, in order to improve further integration of efforts. A concerted action is suggested with extension of inductive programs that forge partnerships between academy and industry in strategic areas. A key factor is to improve publicity and communication between the actors of the technology transfer process. Continuity of the Programs is also essential. Some of the existing programs should be reshaped to reflect the multidisciplinary nature of transfer. Business incubators, for instance, should be established only in areas where infrastructure is available, and in cases where expertise can be provided to help entrepreneurs with training in market and managerial aspects. Going from innovation to effective technology transfer must consider competitiveness of Brazilian companies in economical terms. The government, the parliament and society must work together to improve tax legislation, in addition to extending R&D programs. It is also time for dissemination of the venture capital culture and the role of angel investors in the country, through concrete actions. A missing link in the whole process has been identified, and for that we suggest that professionals entirely dedicated to transfer should be trained.

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