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Adjusting the Intellectual Property Strategy of a Public University Mexican R&D Institute for Harder Times Coming

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Abstract

The Intellectual Protection Unit of the Institute of Applied Sciences and Technology (ICAT) of the National Autonomous University of Mexico (UNAM) has been in existence for two decades. During its first fifteen years of life, the political and economic situation of the country, as well as the influence of innovation theories, guided university work, to promote the development and transfer of technology generated in higher education institutions, towards companies through the establishment of the triple helix formed by the efforts of the government, universities, and companies, all this to boost the economy and the well-being of society. As of 2018, with the advent of the Fourth transformation (4T) proposed, installed, and promoted by the new government, new austerity measures were implemented and many of the schemes used to license technological research and development were modified.

Currently, a new federal government Law on Science, Technology, Humanities, and Innovation has been approved. It proposes intensifying austerity and controlling budgetary allocation to priority government projects with an intense tinge of social benefit.

Taking advantage of the lessons learned during its previous years of performance, this paper proposes that the work of the ICAT R&D project management and linkage office should not fall into a situation of paralysis but rather adjust its management strategies to take advantage

of the situation to fully fulfill its mission pursuing the increase the social impact of its results.

Keywords: Intellectual property strategy, R&D public university institute, México

1. Introduction

The Instrument Center (CI) of the National Autonomous University of México (UNAM) was created in 1971, later, in April 2002, it changed its name to the Center for Applied Sciences and Technological Development (CCADET) and in 2018 it became the actual Institute of Applied Science and Technology (ICAT). The institute has an organizational evolution of 52 years.

During its first thirty-three years, the institute was dedicated to the development of scientific results and technological prototypes; however, there was very little concern about carrying out the intellectual protection of their results nor to transfer them to society. For the same reason, only a few Copyrights of literary works were registered.

In 2002, the current Secretariat for Linking and Technological Management (SL&TM) was created. By then the Center academics had produced more protectable knowledge results, so in 2004 the Intellectual Property Unit was created within the SL&TM. A simple graphic proposal of the evolution of the ICAT is presented in Figure 1.

In the Figure the concern of the institutional authorities during its first thirty years of life (1971-2002) was more related to the establishment and growth of the entity and there was no office in charge of the procedures of R&DT project management, there were not a real concern to protect the intellectual property results of the knowledge generated in it.

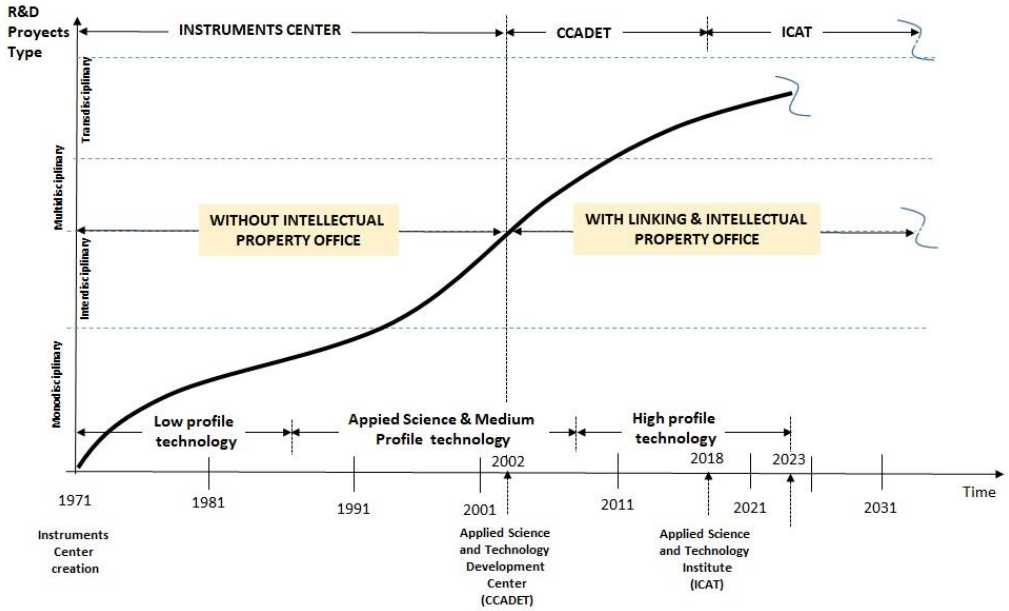

Figure 1. ICAT's organizational evolution

The creation of the Linking Coordination in 2000 and the Intellectual Property Unit in 2002 marked two stages in institutional life, as can be seen in Figures 1 and 2.

The Intellectual Property Unit began activities in 2004 it started with the registration of Copyright of several literary works and computer programs, ISBN and ISSN numbers and trademarks. Later, in 2008, the registration of patents, models and industrial designs began.

The results carried out by the UPI-ICAT throughout its two decades of existence, consists of nearly two hundred copyright certificates for manuals, books, technical informs, computer programs, twelve trademarks, and dozens of ISBN and ISSN numbers, among others. Furthermore, as of 2008 several dozen patents, models and industrial designs have been applied for and obtained.

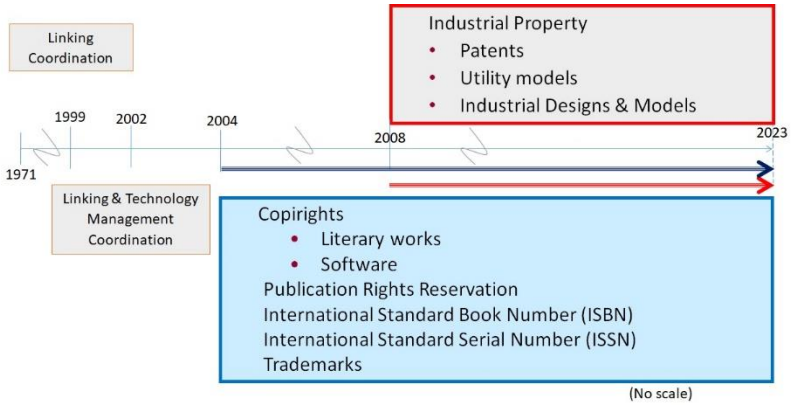

Figure 2. The timeline of Intellectual Property at ICAT

In this work it is underlined the importance of obtaining intellectual property titles and their use for the fulfillment of the objective and mission of ICAT, throughout the different periods where government policies for carrying out research projects, technological development and innovation have been markedly different. Next, the results of the UPI of the ICAT are presented during its two decades of operation to finally discuss the need to adjust the intellectual property strategies to be followed during the next few years, in which deep austerity has been decreed by the authorities of the federal government's science and technology system, to achieve the best results in terms of social impact.

2. Framework

2.1 The Role of the Mexican Public University in the Last Five Decades

Worldwide, the first mission of the public university was the human resources formation through democratic teaching, characterized by the equality of membership, because individuals belonging to different groups should have equal access to educational opportunities. (Anderson, 1995)

By the middle of the 20th century, research was fully recognized in the first world as the second main mission of the University and research partnerships with industry flourished in the early years of the century. Henceforth, along more than 5 centuries the mission of public universities was teaching and perform research and development (R&D).

Early 1990's a new mission was proposed in the first world for public universities. They had to become *agents for economic development* through the knowledge transferred to other society organizations. In such a way, the role, and the contributions of public universities within the Socio-Economic Innovation System (SEIS) of Mexico changed when universities made their contributions for the economic development of the country *transferring or licensing* their proprietary knowledge, to different society organizations (Vega-Gonz áez, 2015)

By the end of the twentieth century public university ́s central role acquired was to transform the talent of its students and its academics into knowledge and learning to increase the competitiveness of organizations from the different economic sectors of the nation. Besides, through the transfer or licensing of the technology generated at universities, country's economy should be promoted.

The transfer of knowledge from university to society organizations, typically adopted several ways. In first place, the human resources trained through bachelor's, master's, and doctoral courses; impact society because some of the graduated students will be employed as professionals in the different firms, industries, and enterprises of the different country economic sectors. Other part of the trained scientists and engineers would eventually take up employment in corporate labs where their training might make essential contributions to innovative activities.

Finally, the university contribution to boost the growth of the economy has been the transfer of the technology obtained from the applied science and technology development performed at university ́s faculties and R&D centers and institutes to other firms or organizations of the country for its commercialization.

Then, the processes of transfer and licensing of technology are at the hearth of the mission of public universities. These processes require of registered intellectual property (IP). The certificates and titles granted by the authority as patents, utility models, industrial designs, copyrights. Therefore, scientific and technology knowledge with IP registers acquire the supreme value of organizational knowledge, above other unregistered intellectual assets, and human and organizational intellectual capital (Contractor, 2000).

IP provide security and legal certainty to the technology transfer agreements signed with firms and industry or other economy sectors.

2.2 Intellectual Property Registers and Titles Handled by ICAT's UPI

2.2.1 Patents

The preferable IP titles commonly used to transfer university technology to enterprises are the patents. Patents have to do with inventions that have been the pillar of technology on which we have built civilization and human progress.

Article 46 of the Federal Law for the Protection of Industrial Property (LFPPI) in force in Mexico defines an invention as: "…all human creation that allows the transformation of matter or energy that exists in nature, for its use by man and to satisfy his specific needs".

(Diario Oficial de la Federación, 2020, DOF-01-07-2020)

An invention must provide a solution to a particular problem and/or contribute to improving the state of the art. For De Icaza and Navav (2007) an invention is a new product or process that solves a technical problem. It is not the same as a discovery, which consists of something that already existed but had not been discovered. An invention is any article, machine, composition or process or new use developed by a human, while a patent is a grant from a government that confers upon an inventor the right to exclude others from making, using, selling, importing, or offering an invention for sale for a fixed period (Pressman, 2009).

Thus, patents are one of the oldest Intellectual Property rights, they are rights granted exclusively by the state on innovative technical inventions product of human creativity, developed by an inventor. The patent system was created to provide inventors with an incentive to disclose their inventions, protecting their inventors' rights.

The origin of the modern patent system began with the installation of the Patent Office in Great Britain at the end of the 15th century, its objective was to strengthen the economy of England by making the country self-sufficient while promoting new industries. The system gradually came to be seen as a way for the government to raise money, through the holders of working patents, without having to incur the public unpopularity of a tax.

Basically, the British government's idea in granting monopoly rights was to attract new industries and technologies from abroad and create new jobs. This remains the political motivation in many countries, although it also appears to be in contradiction with fundamental antitrust philosophies.

The British Charter of monopolies of 1623 declared that monopolies were generally outside the Law, with certain exceptions: Section 6 of the Charter defined that one of those exceptions was the granting of letters of patent. In this way, it was legally justified that, if the patents generated new sources of work or new manufacturing of any matter, these activities would not be considered outside the Law.

Thus, historically, the first requirement for the granting of a patent was its industrial application. This requirement was adopted by all the countries that established their own patent system, such as Spain, Germany, the United States of America, and Mexico, among many others.

The other two basic requirements for the State to grant a patent are universal novelty; that is, that the invention is not in the state of the art and that it has not been previously disclosed and must involve an inventive step or creative intellectual process whose results are not deduced from the state of the art; that is to say, not being obvious or evident (non-obviousness) for an average technician in the matter.

The protection of a patent is territorial; that is, it only applies to the country whose government grants the patent. In other words, if you have a patent granted in the Mexican Republic, it does not protect the inventor in the Republic of Peru or Costa Rica or other countries. On the other hand, the duration of monopoly rights established in international

agreements is 20 years from the date of application.

2.2.2 Utility Patents Utility Models and Design Patents

To boost the economy in some countries of the European Economic Community, small patents or utility models are used in which minor innovations are claimed but with a validity of 10 years. A utility model is like a patent, for that reason, they are sometimes also called “small patents” or “innovation patents”, although logically they have their differences.

A utility model is understood as any invention that, being new and involving an inventive activity, consists of giving an object a configuration, structure or constitution that results in some practically appreciable advantage for its use or manufacture and whose protection lasts for 10 years from the date the said invention is granted.

Any utensil, appliance, or tool that, because of a modification in its arrangement, configuration, or structure, presents a different function with respect to the parts that comprise it or represents an advantage in its usefulness. To grant the title of a utility model, it is not required to prove universal novelty, but it is necessary to prove its inventive degree of non-obviousness for an average technician in the field and that the invention is susceptible to industrial application.

Trade Secrets are any information, design, device, process, composition, technique, or formula that is not known generally and that afford its owner a competitive business advantage. Among the items considered as trade secrets are chemical formulas, manufacturing processes, magic-type trade secrets as laser lights shows, chemical recipes that involve both process and formulas. (Pressman, 2009 page 26)

Finally, in México there are other IP certificates as the Copyright of literary works and computer programs.

3. Technology Transfer Form University to Society

The basic requirement for the transfer of technology from universities to industry or for its licensing to other institutions is to have the integrated laboratory prototype and the intellectual property registrations granted.

In other words, once we have the technology protected, the next step is to promote its transfer to the companies or institutions for which it was developed. It must be remembered that technology is also often generated throughout the teaching and training processes of human resources; so that there is not always an interested company from the beginning of the project. In any case, it is more efficient to start from the technology demand if it exists since the beginning of the project and not ex-post offering the technology developed to unknown potential stakeholders. The technology transfer process is a matter of University-Industry cooperation which has been intensively studied for decades and has a great number of barriers and challenges. In some countries there have been good and bad experiences in the efforts to be competitive and respond to market demands.

Mijo and Qosja (2023) suggest that today it is necessary to make the response of academic

units more dynamic to get closer to entrepreneurs and affect regional innovation. To promote that, they suggest analyzing how universities are involved in university-industry collaboration, making necessary to observe the purpose of university-business cooperation, also to observe the factors that motivate the academic staff to cooperate with the industry and detect the influencing factors, barriers, challenges, and results. They point out that it is necessary to observe systems, practices and instruments universities/departments have set up to enhance university-business cooperation. In the same vein, Khoshkab and Abili (2023) emphasize the importance of having in account the constructive role of the government, since the university and the industry operate within the context of the society their success in interacting with each other is affected by the rules and laws of the system which are policies, programs, and decisions of the government.

In their study for Australian Universities, Litletton et al. (2023) found that to develop University-Industry cooperation the motivations of the stakeholders are: (a) trust and respect; (b) business alignment; (c) employability – mutual benefits; (d) commitment to cause – alignment of values; and (e) innovation/research focus.

Ramirez-Hernandez and Isaza-Castro (2009) point out that in Latin America the absolute and relative sizes of resources invested in scientific and technological research at the university level are subject to economies of scale. In other words, a greater number of resources invested in technological research is associated with increasing levels of innovation and patenting activity. In the sample they investigate, found that in 2014 the number of granted patents to universities were 20.7 for Colombia, 29.3 for Chile, 68.6 for México and 8.7 for Peru. (Ramirez-Hernandez and Isaza-Castro, op cit., page 48). The Latin American public university annual patents granted seems to be a slow-motion process, for example in the period from 2005 to 2023, the number of patents granted to the National Autonomous University of Mexico were 363, to the Mexican Polytechnic National Institute were 214 and for the Autonomous University of Puebla were 102. That means an average from two to 20 patents granted annually. (Vega-Gonzalez et al, 2023)

In a similar research line, Stuart and Olaya (2018) also find out that there is generally low production of patents in Latin American universities, so they discuss strategies and propose mechanisms for the consolidation of transfer offices whose operation is based on offering society the knowledge generated and patented in them. They stress that when patents are used as an indicator of the efforts made toward research and development by the organizations that apply for them; they are an instrument that promotes interaction between the university and businesses, thus driving technology transfer processes. Nevertheless, this way of thinking is questionable since the obtention of patents is not necessarily a precise indicator of the capacity's universities have in the R&D efforts and the technology generation, i.e., in most Mexican public universities patenting technology depends on having the economic resources and the time required to accomplish the process. Besides, as told previously, patents are not the only type of intellectual property titles or certificates, therefore strategies for the use of other knowledge protecting figures must be rehearsed.

4. The Case: Evolution of the Intellectual Property Unit of the ICAT

On Figure 3, we show a graphic sequential model of the R&D projects performed by the ICAT ´s academic groups and the moments to realize IP registers. The comprehensive model intends to represent what occurs from the initial project ideas up to the new technological products being launched and introduced into the market or even into society. There are at least five time periods and moments; (1) the precompetitive technology developed by R&D University institutions, (2) the technology transfer from university to firms, (3) The scaling of the precompetitive technology prototypes performed by the firms in order to obtain competitive scaled products, (4) the market studies for adjusting the product to final customers' needs, and (5) the launching and diffusion of the product into the market.

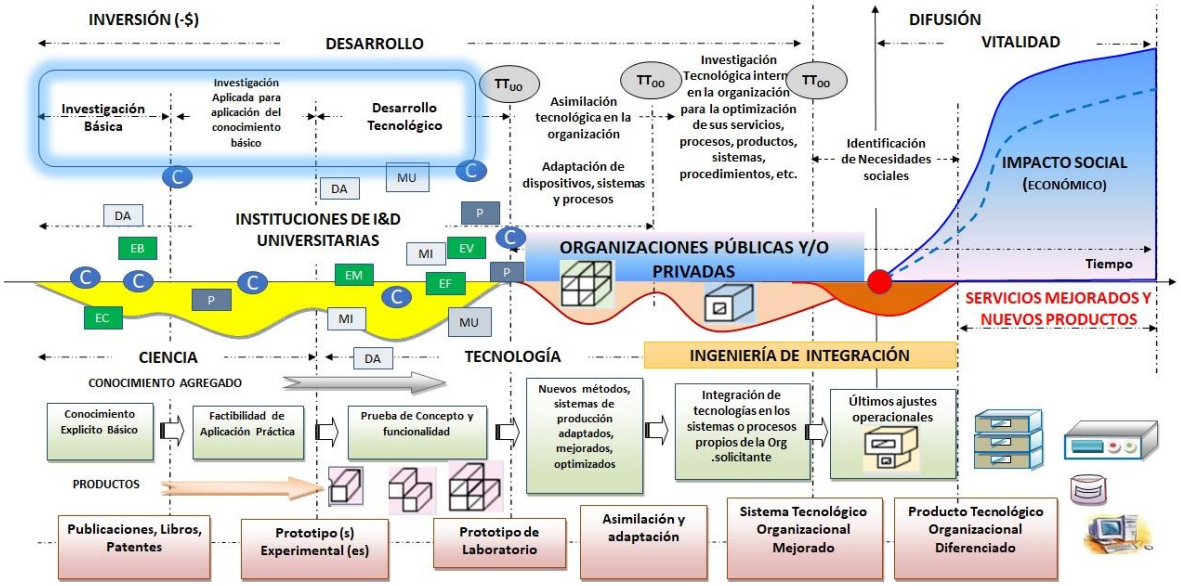

Figure 3. UPI activity in the development of ICAT R&DT projects

The universities main activity within this process occurs in the first periods. That is, some academic university ´s groups can participate doing basic and applied research and technology development while others, such as the technology transfer office work issuing and negotiating different agreement types, carrying out market and technological studies and negotiating the technology transfer agreements. In the ICAT's case, the UPI oversees registering and managing intellectual property titles and certificates such as utility and design patents, copyrights, and trademarks among others.

An idea of the intellectual property figures handled by the ICAT ´s Intellectual Property Unit along its twenty years' operation con be seen in Figure 4.

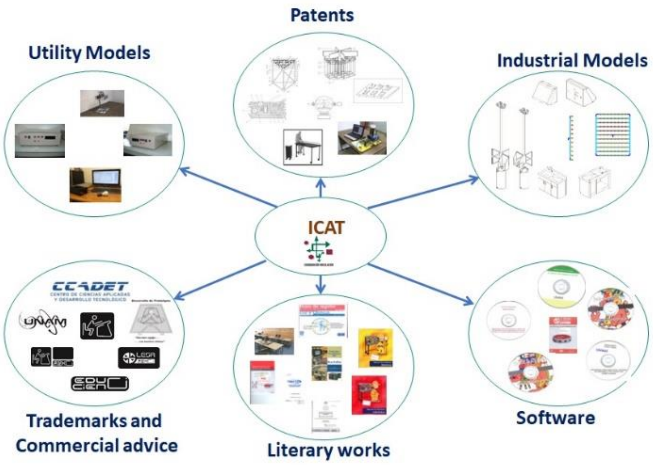

Figure 4. ICAT ´s scope of the intellectual property figures

The results of patents granted to the ICAT from 2008 to date are presented in Figure 5.

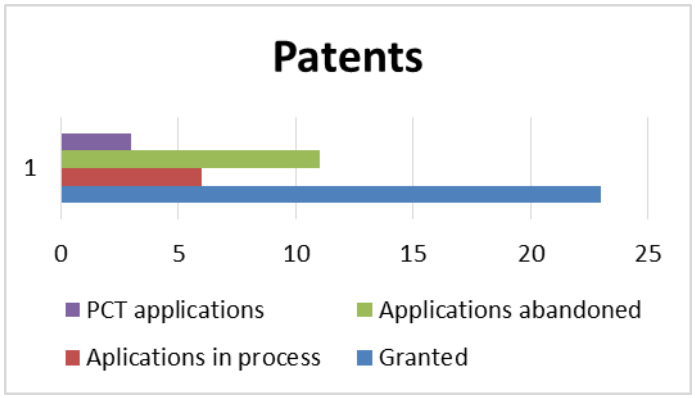

Figure 5. Patents filed and granted to ICAT

On the practical experience obtained in more than 20 years pursuing intellectual property for the Institute, with the results shown in Figures 5 and 6, we have learned, some lessons described to follow.

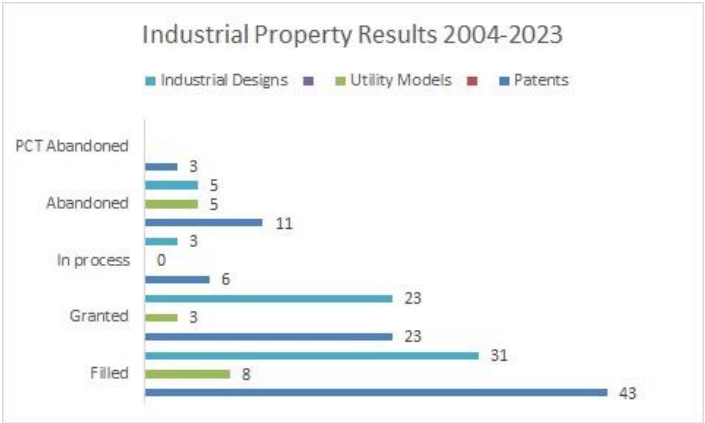

Figure 6. Industrial property results 2004-2023

5. Learning Related to Patent Projects

The practical experience on intellectual property management performed by the UPI for the ICAT R&D groups along more than two decades, has led us to learn some lessons about the behavior of the phenomenon in the context in which the Mexican public university operates. The fields of continuous practical experience of the IPU on patent projects managing have been on conducting state of the art studies, evaluation and redaction of claims, patent writing, filing of files before authority, including searching for funding, and cost management. We also have learned about the difficulties for technology transfer to firms for commercial exploitation of technology.

When an academic or an authority from the institute requests the technology linking and management secretary to carry out the work to obtain a patent, after reviewing the case, a patent project is opened. The patent project can be divided in phases.

The first one is Phase 1 covers the preliminary works required. It is performed by scientific-technological work team and interdisciplinary support, technological and legal management team. In this team participates academic personnel of the institute. A series of interviews are carried out with the inventors to know in depth what the invention consists of and the identification of knowledge with universal novelty to define the state of the art in the matter and draft the claims requested precisely. Senior Management also participates in this phase to direct the way to handle the economic resources. The intellectual protection strategy and the source of financing to cover the different costs involved in patenting are also discussed.

With the above cleared up, begins the second phase characterized by the patent drafting work which begins immediately, as well as the legal management work. Constant meetings are required with the inventors, lawyers, and authorities of the institution, to resolve technical and legal questions. If the technical claims are novel and correctly drafted, a complete first draft of the patent document be available within two to four months. Subsequently comes the last phase which is the logistics and administration work. Likewise, it requires to monitor a process that can take from 4 to 7 years in Mexico for the authority to rule on whether to grant the title or not. Within the last phase the formal examination and the substantive examination are carried out by the governmental authority examiner. Finally, in the case when the patent is granted by the authority, it will be required to manage the written communication with the authority officials and the quinquennial rights payments that must be done throughout the twenty years of patent validity.

5.1 Patents Fees and Costs

The experience obtained in more than 40 patent projects carried out has shown us that the average cost of obtaining a patent in Mexico is between $5,280.00 to $7.900.00 Mexican pesos (approximately $100,000 to $150,000 US dollars). Also, it will take about 64 months for the authority to carry out the formal and substantive examinations.

The total time, considering the actions to solve the requirements or objections of third parties that may exist and make the payment of the different costs that are incurred during the

process can take about 6 or 7 years. (Figure 7)

In summary, patents are the result of complex projects that must be carried on by interdisciplinary teams and requires a lot of time and economic resources. In conclusion, obtaining a patent is a long process that requires a lot of administration and money. Therefore, it is necessary that before all the phases described, responsible personnel formulate an IP strategy and answer the questions: what is the interest of patenting? And what will be the source of the resources?

Everything will depend on the use that will be given to the university patent. In first place, a common thinking is that the patent can be transferred to a company for commercial exploitation, which in theory will improve the economy with the sales of new products, the creation of value and utility, and the generation of new jobs. This can lead to the expansion of existing production, process, or manufacturing lines or to the development of new processing or manufacturing plants to develop new products and services and launch them on the market.

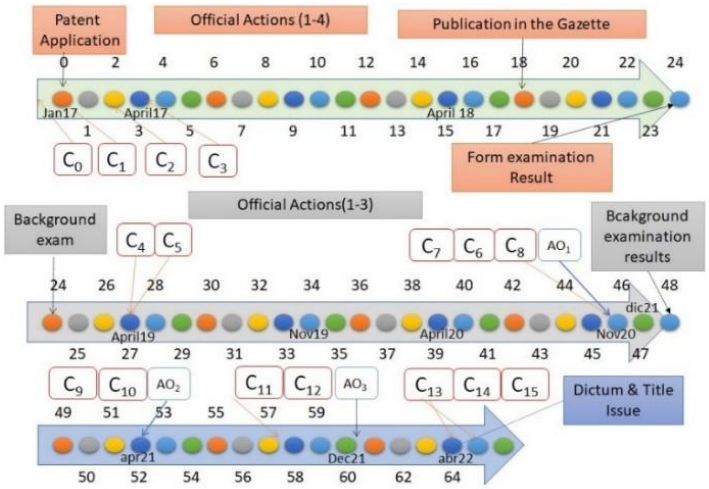

Figure 7. Example of Patent Fees and costs

Obviously, this process requires many investments and other patents that can be provided by the same company or other public and private organizations.

Other modalities of use are: (a) the technology can be licensed at some cost to another R&D institution for use in new research whose results may be the subject to shared intellectual property, (b) the patent can be used as a contribution to establish a strategic technological alliance either with public or private institutions or with other R&D networks, (c) it can also be exploited directly by the university or it can be licensed to a spin-off company made up of university students and academics, (d) finally the technological invention can be licensed to a public institution at low or no cost for its implementation and use with high social impact.

Particularly, at the ICAT we have found that within the framework given by the mission of the institute to seek the application of the knowledge generated to the solution of relevant

problems in our environment, the best IP strategies to cover our needs as a public governmental institution are: (1) we will pursue a patent when invention has high scientific and technological quality and strategical value, that is, it must have a high technological impact (2) we will patent when invention has proved potential to be exploited at market, that is, it must have a high commercial impact (3) we will patent when invention could be used for any public institution in the fields of health, education, security, research and social welfare. That is, it must have a high social impact.

Likewise, as far as possible we will avoid patenting inventions that only have a curricular interest for academic inventors.

6. Learning Related to Technology Transfer

Ellwood et al. (2022) point out that since it is well-established that the early stages of science-based innovation are characterized by uncertainty in the understanding of both technology and markets and also the basis for investment decisions is never secure, projects can stagnate and die falling in what is known as the Valley of Death which is a threat that occurs during the early stages of innovation, at the transition between original scientific research and the commercialization of associated technologies.

Furthermore, we must recognize that in addition to the uncertainties in the process, many times the logic, the vision, and the organizational culture of the different actors in the process of developing interdisciplinary projects is different, which makes technology transfer a difficult and complex process, According to Vohora et al. (2004), there are “critical junctures” when passing between stages in science commercialization process. Critical junctures are challenges or barriers that need to be overcome for the project team to acquire the capability to synthesize scientific knowledge with an understanding of the market to which it may apply. In same regard, Evans and Miklosik (2017) also indicate that university and business leaders must overcome barriers like limited resources, lack of capabilities and the absence of university support to establish University-Industry Collaboration (UIC) agreements. Nevertheless, Pereira et al. (2013) realized empirical research in PYMES and found some evidence that the barriers to cooperation seem to be overcome by interpersonal relations; however, sometimes there are trust crisis which means going from building trust to destroying trust (Oliver et al., 2020).

Independently of the firm size, once a fluid communication is reached, may be one of the most important University-Industry Collaboration (UIC) agreement is the technology transfer agreement.

Transfer patents and other property titles from university to industry requires a strategy whose formulation depends on who will be the recipient of the technology, which, as we have said, can be an established company, a public institution, another research and development institution, or a spin-off company, among other possibilities.

The goal is to transfer the technology to a company for its commercial exploitation which in theory will improve the economy with the sales of new products, the creation of value, profits, and the generation of new jobs. To carry out this, the company can expand some of its

existing production, process, manufacturing lines, or develop new processing or manufacturing plants to produce a new product or service and launch it to the market.

For these new product development projects, in addition to contributing its own knowledge and its fundamental know-how, the company can contribute with other patents that are its property, or those of other participating public and/or private organizations. In any case, a *sine qua none* aspect is that these projects will require significant economic investments.

But there are other options for the intellectual property intangible assets, for example the patent can be also used as a contribution to establish a strategic technological alliance either with public or private institutions or with other R&D networks. Another possibility is that the technological invention of the patent can be licensed to a public institution with little or no cost for its implementation and use. The benefits of this approach are that institution can reach and solve some society problems fulfilling its organizational mission and objectives. The ICAT´s experience in this area has been with federal government hospitals of the Health Sector.

7. The Expected Hard Economic Times to Come

Pujotomo et al. (2023) pose that worldwide Universities have recently seen a reduction in public funding and an increase in rivalry from other research organizations. In this vein, the Mexican governmental context is to follow.

At the end of 2018, Andrés Manuel López Obrador took office as president of Mexico, leading what he calls the Fourth Transformation of Mexico. (Villegas, 2018; Rojas, 2018). This political-social movement has been characterized by austerity and the fight against corruption in all entities and dependencies of the public sector. Based on the austerity policy, throughout 2019 and so far in 2020, many changes have been made to the country's public institutions.

With this tranformation, many government entities have been affected by the reduction in public spending, with a decrease in their budgets for operating expenses with percentages ranging from 15% to 25 or 30%.

On July 2, 2019, by presidential decree, the Federal Republican Austerity Law was issued. This law establishes the way in which the savings system must be applied and complied with in the dependencies, such as, in the powers of the Union, the autonomous bodies and the various federal authorities of the Republic, regardless of their legal nature (DOF: 11/19/2019).

Subsequently, based on a decree published in the Official Gazette of the Federation on April 2, 2020 (DOF: 04/02/2020), a hundred culture and science trusts were extinguished. Additionally, several government institutions were closed.

Along last years the operation of the National Science and Technology Council has been changing in its bases, regulations, and procedures, likewise, the calls and financing of projects have been limited since 2018, during the COVID’s pandemics and up today.

Besides, on December 13, 2022, the Federal Executive Power presented the initiative for a General Law on Humanities, Sciences, Technologies and Innovation (HCTI), guaranteeing the human right to science and transforming the National Council of Science and Technology (CONACYT) as the National Council of Humanities, Sciences and Technologies (CONAHCYT), without restricting the freedom of research and promoting the increase of public financing in a progressive manner; supporting plurality, existence and respect for our ancient cultures and making knowledge a common good (CONAHCYT, 2023)

Nevertheless, during and after pandemics there have only been some calls for specific projects and the expectation is that it will not be until after the new HCTI Law is approved that there will again be resources available so that universities and science and technology teaching institutions can again develop research and technological development projects.

A very important aspect of this process is that the new Law under discussion provides that the knowledge results obtained from projects financed with public government money will be property of the federal government; that is to say, patents, utility models, industrial models and other figures, certificates and titles of intellectual property will become administered by the federal government. This situation is under study, discussion, and analysis. Possibly a mixed ownership agreement between the federal government and the universities will be reached, so we can expect that soon the federal government will intervene in some way in the technology transfer strategy. This will naturally be a watershed since the issuance of the Bayh Dole Act in 1980, ownership of the technology developed with government resources, both in the United States of America and in Mexico, was considered university property and according to regulations of each institution, the academics could have a certain participation in the royalties or resources obtained.

7.1 After the Covid 19 Pandemics

The first reported case of COVID-19 was detected in Mexico on February 27, 2020. Most of the COVID-19 cases were in Mexico City. Initially, the highest number of infected occurs in the age range between 30 and 59 years, and there was a higher incidence in men than in women. As all over the world the deceased patients had one or multiple comorbidities as hypertension, diabetes, and obesity (Suárez et al., 2020).

By May 2023, the number of infections has been approximately 7.4 million cases, while the number of deaths in Mexico has been 333,908 (Expansión, 2023; El Financiero, 2023).

According to Menéndez (2005), probably in México, the numbers of infections and deaths obey to the social inequalities and inequities existing in the country because of the Mexican Neoliberal Health Sector Politics occurring between 1980 to 2004 where decentralization, reduction of health spending, selective primary care, health commercialism, and privatization of health services were the main processes. Crisis probably began in 1980 when the economic politic process was characterized by the low economic growth, the persistence and deepening of socioeconomic inequalities, the increasing concentration of wealth in a small sector of society, and the expansion of the situation of poverty and extreme poverty that led to talk about two lost decades.

Arellano (2022) coincide that the structural problems of the Mexican economy and the narrowness of the fiscal space did not arise with the pandemic, they were configured during the last three decades with the implementation of the economic model that privileged market-oriented policies and the withdrawal of state intervention in the economy, in search of a supposed efficiency in the allocation of resources and productive factors. In summary, the health crisis has been affected by government policies that cause social inequality, spatial segregation, and vulnerability. All the economy sectors were impacted, particularly Education.

On the other side, the socio-economic crisis represents an opportunity to promote a new economic model that transcends economic policies with neoliberal roots, through the design and implementation of a policy for the transformation and diversification of production, industrial development, innovation, science, and technology. Besides, between 2012 to 2018, the average annual growth rate of the economy has been restricted (2.4%)

To face the crisis, the government would rigorously apply the Federal Republican Austerity Law; no worker would be fired; voluntarily, the salary of senior officials would be reduced by up to 25% progressively; 75% of the budget available for general services, materials and supplies, and the resources would be available promptly for the delivery.

Among the social programs, the following stand out: Well-being for the Elderly (8.4 million beneficiaries); Pension for the Welfare of Persons with Disabilities (850, 100 people); Youth Building the Future Program (1.3 million youth); Scholarships for Benito Juárez Well-being (11.7 million students); Support for boys, girls, children of working mothers (185,000 beneficiaries) (Arellano op cit, page 848). The economic crisis caused by the COVID 19 pandemic simultaneously be added to the republican austerity decrees in Mexico.

8. Adjusting the IP Strategy

Undoubtedly, given the current political-economic situation that the various sectors of the Mexican economy are going through, and after the peak of the crisis provoked by the COVID 19 pandemic, it is necessary public universities R&D centers and institutes be planning and adjust intellectual property management strategies or develop and use new ones, aimed at the transfer and/or licensing of results to other government institutions. What we are looking for with this strategy, is that the results of knowledge developed by the ICAT have more and deeper society impacts. Proceeding in this way echoes the thought of Hoxsa (2023), in the sense that universities' "third mission", is a powerful tool to boost innovation in the country by encapsulating the rising demands to take a more visible role in stimulating and guiding the utilization of knowledge not just for economic development, but for social, cultural, and many other society ́s demands.

Furthermore, it would be nice if the new ICAT's strategy for intellectual property will be consonant with the final articles and results of the new Health Science Technology and Innovation Law.

8.1 The New IP Strategy

Due to the existing situation in the environment or innovation ecosystem it is necessary to formulate an IP strategy: what is the interest of patenting? And what will be the source of the resources?

As has been discussed in the previous section, patents are the result of complex projects that require interdisciplinary teams and a lot of time to be successful. Furthermore, obtaining a patent is a very expensive process and requires a lot of administration. However, technology licensing does not always require having patent titles. In any case, the higher costs will be due to legal claims.

From the country economics situation described, it is expected that transfer technology from the ICAT which is a public university R&D institute to industrial firms or companies will become more and more intensive. Therefore, there will be essential first to identify the interested companies, bring them to the negotiating table, demonstrate technological and commercial feasibility, profitability, production feasibility of the technology to be transferred and make a good negotiation since normally entrepreneurs will want to pay as little as possible.

Therefore, it is suggested that to optimize scarce resources, the new cases of technology transfer to companies are those in which the interest, financing and support of the companies are preferably and mandatory from the beginning of the R&D projects. Experience shows that possibly only between 1% and 2% of UNAM intellectual property certificates or titles have been transferred and/or licensed to organizations from the different public, private and social sectors of the Mexican economy, for that reason it will be essential to give priority to the demand for technology and not to the offer of it.

On the other hand, it is necessary to fulfill the mission established for the organization which is to carry out research, technological development, professional training, and dissemination of knowledge developed in various science and technology fields, with a multi and interdisciplinary approach, integrating research and technological development activities and seeking to apply the knowledge generated to the solution of relevant problems of our environment.

It will be hard to do because it is expected that the economic impact of the institute technology transfers will decrease because of the difficulties to transfer technology to firms, so efforts need to be made to redirect transfer or the technology licensing to government institutions to pursue higher social impact.

ICAT’s experience, show that patents are not required to transfer or license university technology to institutions that have a social impact such as hospitals, educational institutions, security, water, environment, and many others. Also, it will be also expected that public institutions will have problems paying royalties or one-time payments for technology transfers or licensing, so instead of patents may be preferable to use other intellectual property figures such as copyright of computer programs, copyright of literary works, manuals, books, design models, trademarks, and utility models when possible.

Finally, it is possible to use all the IP certificates and titles that the institution possesses to transfer the university´s technology to academics and students spin off companies or to establish strategic alliances with other R&D institutions.

9. Conclusion

When applying the adjusted IP strategy for the new harder times coming in México efforts will be made to increase the number of transfers or licensing of the technology generated by the institution to disseminate the research and technology generated to boost greater economic and/or social impacts in the country, at the same time contributing to the solution of the relevant problems it has. In this way, the tip of the value pyramid of organizational knowledge and intangible assets be increased as shown in Figure 8.

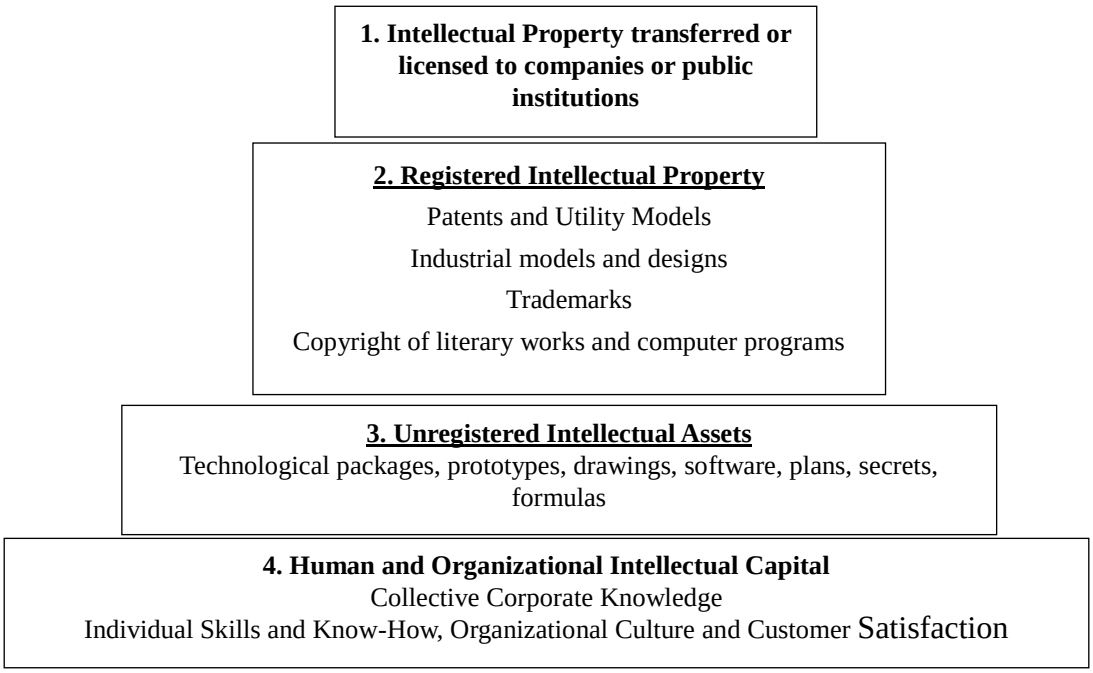

Figure 8. Organizational Knowledge and intangible assets value Pyramid

Source: Modified from Contractor, 2000.

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