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## MEDICAL EDUCATION

# The costs of patenting in Mexico



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**Abstract** Many researchers and scholars do not know that the total costs to obtain a patent are considerable and that the implementation of a logistics system and specific management to carry out the process successfully is required. The aim of this paper is to show, through empirical evidence, that patenting costs are considerable. The methodology is the analysis of selected and representative cases of the total costs over the project routes, incurred by an R&D Center of the National Autonomous University of Mexico (UNAM), during the processes performed to obtain patents for some academic inventions. The findings are that the costs that were incurred to obtain two national patents were quite significant, but much more in the case of patent applications abroad, either by direct application or through the Patent Cooperation Treaty (PCT).

We also found that the process time takes an average of three to six years, depending on the type of patent application. Finally, the costs shown could be considered as *reference costs* for budget preparation. Nevertheless, the process does not guarantee obtaining patent titles in all cases.

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### PALABRAS CLAVE

Costo de patentar;  
Instituciones  
públicas;  
México

### Los costos de patentar en México

**Resumen** Muchos investigadores y académicos desconocen que los costos para solicitar y obtener una patente son considerables y que se requiere de la implantación de un sistema logístico y de administración especializado para llevar a cabo el proceso con éxito. El objetivo de este trabajo es mostrar que los costos de patentar no son bajos a través de evidencia empírica. La metodología es el análisis de casos seleccionados y representativos de los costos vertidos en las rutas de tiempo en los que incurrió un Centro de investigación y desarrollo de la

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Universidad Nacional Autónoma de México (UNAM) durante los procesos de patentamiento para algunas invenciones seleccionadas. Los hallazgos son, que los costos en los que se incurrió para obtener patentes nacionales y patentes solicitadas en el extranjero, tanto por solicitud directa, como a través del Tratado de Cooperación en materia de Patentes (PCT) fueron significativos. También encontramos que el proceso, desde que se somete la solicitud, hasta la obtención del título, tomará entre tres a seis años en promedio, dependiendo del tipo de patente solicitada. Finalmente, los costos mostrados se pueden considerar como *costos de referencia* para la realización de presupuestos, aunque se debe considerar que no en todos los casos en los que se solicite una patente, se obtendrá el título.

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## Introduction

The large growth of the economy in *developed countries*, particularly in the United States of America, as well as the proliferation and steady growth of the number of patents applied for and granted, have generated stress and tensions in companies, organisations and individuals that seek to remain globally competitive.<sup>1</sup> The patenting strategies followed by responsible institutions or sector heads seek to facilitate the global positioning of countries in a given technological area,<sup>2</sup> and prioritise the use of federal funds for research and development in those inventions that have economic potential.<sup>3</sup>

Universities play critical roles in first world society as they have the triple mission of training human resources, researching and contributing to innovations that boost the economy. However, they do not develop or commercialise their inventions completely, but generally establish licensing agreements with firms in the industrial sector.<sup>4</sup>

On the other hand, Academic Medical Centres (AMC) have a major impact on the health sector because they have the mission of teaching health professionals, as well as conducting biomedical research and obtaining new discoveries and medical technologies, for which they receive significant government funding.<sup>5</sup> With the emergence of the Bayh Dole Act in 1980, scholars from both universities and public health institutions were given the authority to patent and exploit discoveries in research financed by federal funding.<sup>6</sup>

The situation in developing countries is substantially different. Although it is true that their governments now recognise the importance of Research, Development and Innovation (R&D&I) activities and that innovation can be understood as the engine of economic development that produces important benefits and favourable social impacts, the rates of patents applied for and granted have been very low until recent years.

In Mexico, the 2014–2018 Development Plan and the Special Science and Technology Programme (PECyT in Spanish) mention the importance of inventors of organisations, companies, different economic and social sectors; as well as universities and public research institutions, to develop technology and patent it.<sup>7</sup> Naturally, public institutions must assume these mandates in their institutional development

plans, in addition to the topics related to training human resources. They also refer to the increase of their patents and technological transfers in the chapter on strengthening links with the production, business, public and social sectors.<sup>8,9</sup>

Therefore, assuming that today, either due to their mission or technological strategy, public institutions with a high social impact, such as hospitals, health institutes, and universities, among others, must patent and transfer their technologies. Why patent? Patents are property titles through which the state grants the monopoly of exploitation to inventors, and are used by firms to implement and consolidate commercial strategies, such as delaying the entry of generic drugs into the market as long as possible,<sup>10</sup> developing a family of patents to extend the exploitation period of an invention,<sup>11</sup> or even abandoning patents.<sup>12</sup>

Patent management is not only a technological and legal problem, but also an administrative and costs one. For example, at the end of the last century, the National Institutes of Health (NIH) of the United States of America, after applying for a first patent to claim ownership of genes in the human genome, was at a crossroads of deciding whether or not to claim 2375 additional gene fragments<sup>13</sup> – which only represented 5% of human genes. The point here is the size and cost of the patent, whose extension would probably be several hundred sheets of sequences that would require the work of multiple, very high-level specialists and a highly specialised patent law firm. The matter does not end with obtaining patents. When inventions have a high commercial potential, the time comes for lawsuits from other interested parties,<sup>14–17</sup> which involve even greater costs if no reasonable agreement is reached between the parties.

Entering the world of patents requires planning and budgeting to meet the costs that institutions will incur. It is a long journey in which everything *starts* with the application process and obtaining a patent which we can call *simple*. For this reason, the objective of this study is to perform an analysis of the costs involved in different patenting processes through the empirical evidence from selected case studies.

In their daily work, academics, students and the support staff of schools, centres and public health research institutes of developed countries,<sup>18</sup> as well as the public

universities in Mexico<sup>19,20</sup> and Latin America,<sup>21,22</sup> develop academic projects and technological research and development (R&D) projects which result in highly diverse knowledge. This often takes the form of prototypes, new processes, new molecules and technological products, among others. These can often be considered inventions. Once the projects are completed, and in some cases even before, the strategy of intellectual protection according to institutional strategies is presented. In many cases it is considered that the best form of protection is to obtain a patent.

In many sectors of the economy, possibly out of ignorance, there is the misconception that patenting is a low-cost process, possibly because people consider that the main cost is the payment of fees charged by the government when submitting an application for a patent. But this is just the beginning. According to Abbott,<sup>23</sup> the actual costs are difficult to estimate because they are distributed among the costs incurred by applicants, patent offices and lawyers or patents. So, in reality, how much does it cost to protect an invention?

The Vice-Rector for Research and Development at the Universidad de Chile,<sup>24</sup> gives the following answer:

“Every process for obtaining an invention patent involves a series of associated costs, which vary depending on a number of factors, both within a country and from one state to another. For example: the nature of the invention, the complexity of the technology, the fees of specialists (experts, lawyers or patent agents, etc.), and oppositions that may be filed at each patent office. In addition, the countries in which protection is sought must also be considered, and, in specific cases, translation costs, maintenance fees and costs associated with the observance of rights, among other aspects”.

Therefore, the costs of applying for and obtaining a patent are not only those corresponding to its rights that are charged by the government office, but the patenting process begins with work prior to the patent application and continues with a long process that concludes in obtaining the title. This is practically equivalent to completing a project; of course, an intellectual property project, which means that immediately before starting this work it is *essential to draw up an estimated appropriate budget* when defining the protection strategy of an invention.

According to Aguirre,<sup>25</sup> there are always other costs related to contracts. They can be linked to the writing, negotiation and safeguarding of such contracts. There are also costs when contracts are poorly drafted and, depending on the circumstances, must be realigned. Something similar happens in the field of patents since there are a series of action costs prior to submitting the patent application. Other costs occur during the evaluation processes of the Patent Offices, still others when there are oppositions and it becomes necessary to refine and/or realign the claims and finally the costs of the rights, maintenance and administration. In practice, we find different specific costs that will inevitably exist in any patenting process, among which are:

- 1) Costs of preparing and presenting to the Patent Office
  - Search for prior art, made by an expert in the field.

- Hiring specialist lawyers or patent agents for drafting (where applicable).
  - National and international processing of the application.
  - Payment of official filing fees with the National Patent Office. A cost which, according to the above, varies depending on each country.
- 2) Costs during form and substantive exams
    - Payment of drafting and response to the Official Actions or requirements of the Patent Office during formal and substantive examinations.
    - Payment of expert reports to carry out the examination(s) done by each Patent Office during the so-called “Substantive Examination”.
    - Specialist fees to face opposition.
  - 3) Final processing costs
    - Payment for issuing rights of the title.
    - Payment of maintenance fees, according to the respective legislation.
    - Payment of the administration of patents in the institution.
    - Payment of legal staff.

In addition to the above list, it should be noted that according to the Small and Medium Businesses Division of the World Intellectual Property Organization (WIPO), there are other costs in a patent application, which depend on other essential factors such as: (a) the field of technology, (b) the nature of the invention, (c) the length of the patent application, (e) the number of claims, (f) the fees of patent agents, the total time of preparation and follow-up of the application, (g) the draftsman’s fees to prepare the drawings, (h) the number of countries to be covered, (i) the route used to submit patents in other countries, (j) the costs of translating applications made in foreign countries, (k) the number and nature of objections issued by the examiner, and (l) the costs of preparing responses to opposition proceedings or appeals.<sup>26</sup>

It can be seen that there is a great diversity in the cost sources of the process followed to obtain a patent, or *patenting* process. Therefore, it is essential to make a good budget, for which experienced advisers can be consulted; it is also necessary to document the different sources of financing that may be used. At present, development entities that grant government financing have become the preferred option of individuals or companies who do not have the means to handle the national and/or international processing of a patent application.

Below is the true cost information of actual patenting projects of some inventions developed by academic groups from the Centre for Applied Sciences and Technological Development (CCADET) from the Universidad Nacional Autónoma de México, which since 2012, by agreement, has a Research and Technological Development Unit (UIDT in Spanish) in the Hospital General de México. It can be seen that the costs range from preparing and drafting the application to obtaining the patent title. The cases included are typical or common in patent management: national patents, patents abroad and patents abroad through the Patent Cooperation Treaty (PCT). The idea is to help academics, entrepreneurs or even companies that intend to apply for a patent, in the

preparation of an approximate budget from which to manage the resources that will be necessary for that purpose.

### Case 1: Times and costs of a National Patent

In the time path in Fig. 2, the process that must be followed to obtain a patent in Mexico is presented. The first part is known as a Form Examination, which takes twelve (12) to eighteen (18) months from the submission of the application until its publication in the Gazette of the Mexican Institute of Intellectual Property (IMPI in Spanish).<sup>27</sup> After it is published in the Gazette, the possible competitors, who are frequently on the lookout for new inventions that can compete with them in the market, have six months; in other words, until month 24 to establish opposition hearings. Here, it should be noted that if this were the case, both the costs and the length of time incurred in facing the opposition trial will have to be considered. Two things can happen, (a) when good arguments are presented, the ruling is obtained in our favour, (b) the hearing is lost and the patent has to be given up, which favours the opponent.

However, that is not all; even if there are no oppositions, during this phase the authority, i.e. the Government Patent Office, may submit to the applicant between one (1) to four (4) official actions or requests, which means that it may ask questions or official clarifications regarding the form of the application document, which must be answered formally and directly by the applicant or his/her legal representative.

If there are no opposition trials or official actions; or, when all this is solved, the second phase starts, known as the Substantive Test, which in turn can take an average of eighteen (18) additional months and during which time from one to four (4) official actions can also be submitted, by means of which the Patent Office can clarify its doubts about the novelty or the inventive degree of the inventions. Depending on the complexity of the question, each Official Action that is submitted may increase the application time by a couple of months on average, which will be added to the total time required to obtain the patent. Once the formal examination is completed, the IMPI presents the applicant with a formal examination report in about the forty-second month (42). A few months later, it formally notifies the applicant or his/her legal representative of the granting of the patent and in Mexico, until now, the corresponding fees must be paid. It should be noted that in other countries, such as Peru and Colombia, the Patent Office requires the applicant to pay the patent annuities from the first year of the process, even if it has not been granted.

The estimated average total time to obtain a patent is between three and five years, when there are no official actions during the form and substantive examinations. Otherwise, the required time may grow to approximately seven years.

In addition, in the example in Fig. 1, the costs incurred in the process of obtaining a national patent for a sustainable energy saving device are presented. The time required to cover the process from the patent application until it was granted was 53 months and incurred at least fifteen (15) different cost points ( $C_1, C_2, C_3, \dots, C_{15}$ ). Table 1 shows the detailed breakdown of costs.

Costs  $C_3$  and  $C_4$  were presented to month three, i.e. April 2008, costs  $C_5$  and  $C_6$  were presented up to month twenty-seven; i.e., in April 2011. Costs  $C_7, C_8$  and  $C_9$  in month thirty-four; i.e. in November 2011.

Cost  $C_{10}$  occurred in April 2012 costs  $C_{14}$  and  $C_{15}$  one year later; i.e., in April 2013. Throughout the process, a voluntary amendment and three official actions  $OA_1, OA_2$  and  $OA_3$  were performed.

The form examination report was received in month 24 and the substantive examination report in month 48 and the opinion for issuing the title was obtained by month 64. As can be seen, obtaining a national patent required a little more than 5 years.

The total cost to obtain the patent title was \$54,628.81 Mexican pesos, which is equal to \$3414.30 USD.

Costs  $C_1$  and  $C_2$  were presented at least one month before the application date (January 2008) which is considered as month zero or month of commencement of the process.

### Case 2: Patent in the United States: adjustment method and device

Some technologies developed in the Centre have evident commercial feasibility. When this happens, the academic inventors, the director of the Centre and the person in charge of Technology Management meet and discuss the best industrial protection strategy. In this second case, it was decided to complete the protection abroad.

Since patenting is a fundamentally legal process, carrying it out requires knowledge of the laws of the country in which it is intended to be protected. For this reason, it is essential to identify a law firm that operates in the country or countries in which the patent is sought, which is also reliable and charges moderate fees. In the example below, it was decided to patent in the United States.

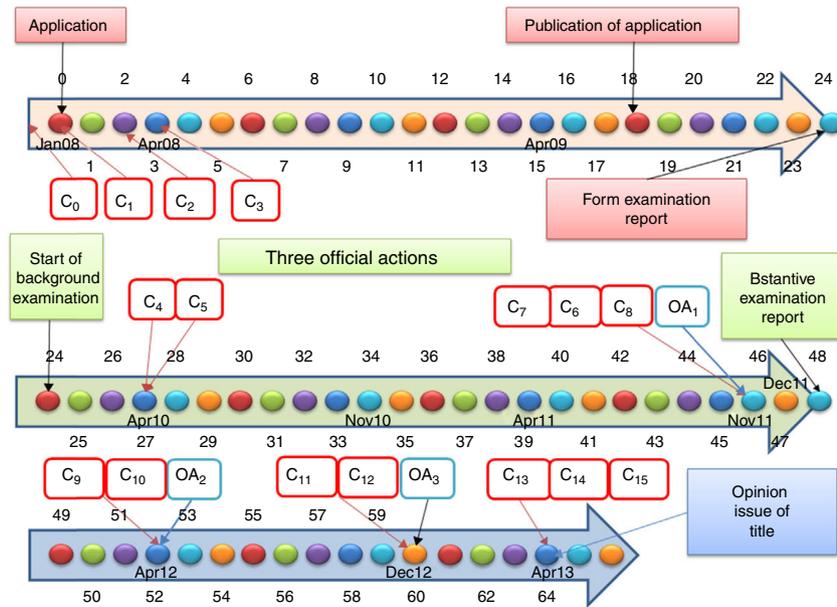
Fig. 2 shows the process and cost points incurred and Table 2 shows the breakdown of costs incurred.

The total cost incurred to obtain the patent title in the United States of America was \$182,671.20 MN which equals approximately \$11,417.00 USD. The time required to obtain the patent from the start of the project was approximately 2 years and eight months (31 months). The time from when the application was submitted to the US Patent Office was 2 years and approximately 3 months.

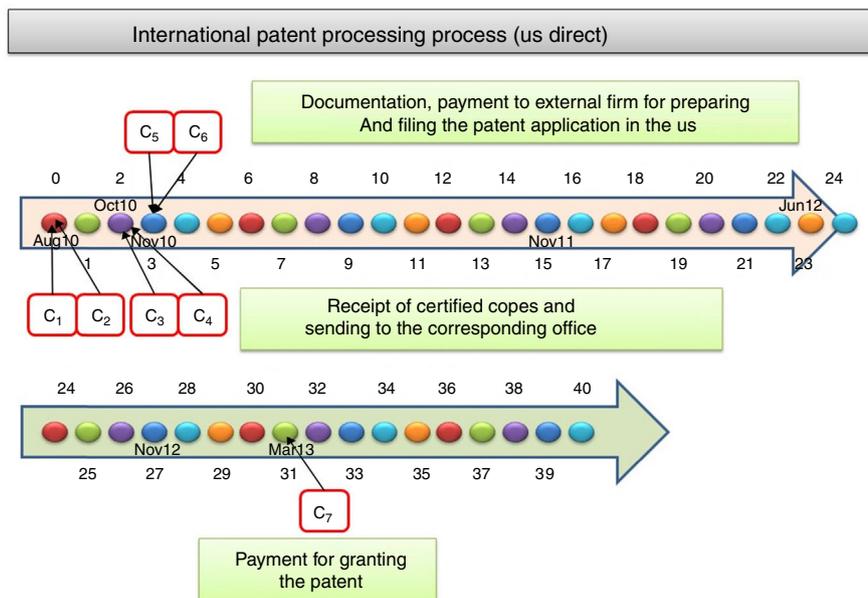
Interestingly, the time for obtaining the patent was much lower than that required to obtain a national patent; however, it should be noted that an invention was patented which received no request from the US Patent Office in which it was filed. Therefore, it is necessary to consider that in the case of having to resolve an objection or request, the cost could rise between approximately 15% and 50%. Also, the time could be affected by a similar or greater time. Everything depends on the situation, or request to solve.

### Patent application through the Patent Cooperation Treaty

In the case of inventions in which previous studies have shown that they have a great possibility of being marketed



**Figure 1** Diagram of times and costs in the case of a national patent. The information of all the cases presented is reliable and can be found in the archives of the Coordination of Linking and Technological Management of CCADET. It is presented here based on the Regulation of Transparency and Access to Public Information of the UNAM.



**Figure 2** Diagram of times and costs of the patent in the US.

in different countries, from abroad, it is possible to choose patents, through the Patent Cooperation Treaty (PCT).

The application process for a patent via PCT consists of two phases. The first phase takes thirty months and is known as the international phase. The national phase begins at the end of the international phase, and its completion times vary depending on the times that are required to complement the process in each country being applied for. See Fig. 3.

Once the patent is applied for in month zero, the international search report is delivered by the International Office of the Industrial Property System in which the process was

carried out around the tenth month. In the PCT System, the applicant *has the possibility to amend his/her claims* between months 12 and 16. This often depends on the protection strategy or market considerations. The application is published in month 18 and this is when a competitor interested that its market is not invaded can object to the patent being granted by submitting a formal letter to the Industrial Property Office stating its disagreement.

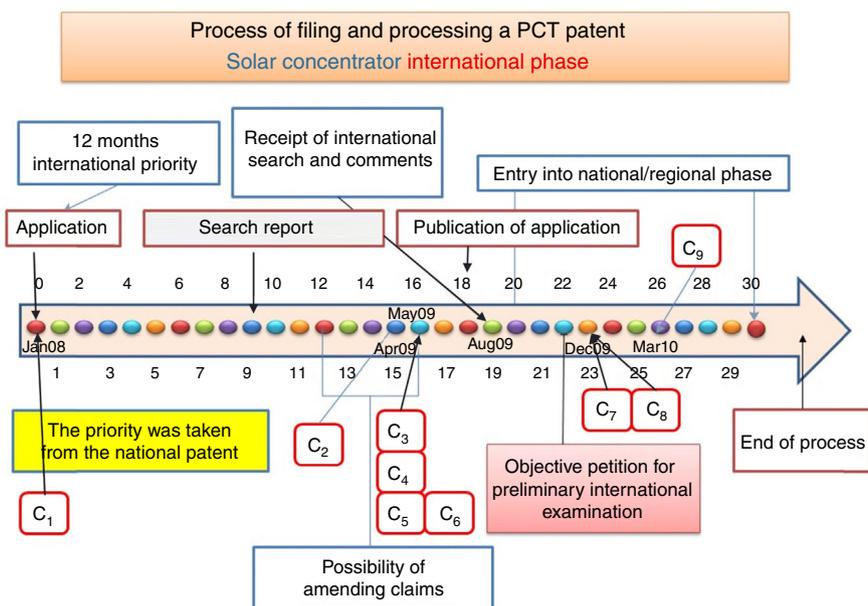
If this does not happen, by month 22, the applicant has the option of requesting the international preliminary examination or not. Conducting this preliminary substantive

**Table 1** Costs of a national energy-saving patent technology.

Dates	Costs (Cx)	Item	Cost	Tax (16%)	Total
10/2007	C0	Cost of searching the state for the art	\$10,000.00	\$1600.00	\$11,600.00
01/2008	C1	Drafting of patent technical report (external advisor)	\$17,000.00	\$2720.00	\$19,720.00
04/2008	C2	Preparation of documentation required for its preparation	\$5000.00	\$80.00	\$580.00
18/04/2008	C3	Payment of rights for the filing of patent applications, patents, as well as for the services referred to in article 38 of the Law; as an educational institution	\$3788.70	\$606.19	\$4394.89
04/2010	C4	Preparation of an amendment	\$750.00	\$120.00	\$870.00
04/2010	C5	Payment of voluntary amendment rights refers to article 38 of the Law; as an educational institution Subject: order of the name of the inventors	\$250.44	\$40.56	\$291.00
11/2011	C6	Response of the first requirement resulting from the substantive examination	\$1000.00	\$160.00	\$1160.00
11/2011	C7	Payment of rights by crediting representative	\$82.33	\$13.17	\$95.50
11/2011	C8	Payment of rights for review of each replacement of documentation, clarification or rectification of omissions resulting from the substantive examination. Request (OA1)	\$603.01	\$96.48	\$699.49
04/2012	C9	Response to the second request (arrived in January 2012)	\$1000.00	\$160.00	\$1160.00
04/2012	C10	Payment of rights for review of each replacement of documentation, clarification or rectification of omissions resulting from the substantive examination. 2nd request (OA2)	\$603.01	\$96.48	\$699.49
12/2012	C11	Response to the third request (arrived in August 2012)	\$1000.00	\$160.00	\$1160.00
12/2012	C12	Payment of rights for replacement of documentation, clarification or rectification of omissions resulting from the substantive examination. 3rd request: (OA3)	\$603.01	\$96.48	\$699.49
04/2013		Payment notice for granting received	\$0.00	\$0.00	\$0.00
04/2013	C13	Preparation of documentation required for issuing title	\$750.00	\$120.00	\$870.00
04/2013	C14	Payment for issuing Patent Title	\$1455.94	\$232.95	\$1688.89
04/2013	C15	Payment for a five-year period of conservation annuities	\$3206.95	\$513.11	\$3720.06
		TOTAL EXTERNAL CONSULTANT			\$19,720.00
		Total administrative costs PI unit			\$17,400.00
		TOTAL RIGHTS			\$12,288.81
		<u>TOTAL COST UNTIL GRANTING</u>			<u>\$54,628.81</u>

**Table 2** Costs of obtaining a patent in the United States.

Date	Cost (Cx)	Item	Cost	Taxes (16%)	Total Pesos
01/08/2010	C1	Cost of searching the state for the art	\$10,000.00	\$1600.00	\$11,600.00
01/08/2010	C2	Drafting of patent technical report	\$17,000.00	\$2720.00	\$19,720.00
28/10/2010	C3	Translation of the technical report for submission	\$1800.00	\$288.00	\$2088.00
15/10/2010	C4	Preparation of the necessary documentation (assignments of rights, power of Attorney General, letters)	\$3500.00	\$800.00	\$4300.00
28/11/2010	C5	For certified copies	\$313.20	\$61.80	\$375.00
28/11/2010	C6	Preparation and submission of a patent application in the United States of America by a Law Firm with Associated Office plus Payment Fees in USPTO and correspondent fees	\$84,645.00	\$13,543.20	\$98,188.20
22/03/2013	C7	Payment for granting the patent application in the US	\$40,000.00	\$6400.00	\$46,400.00
		External Consultants (Drafting and American Law Firm)			\$119,996.2
		Total Administrative Costs PI Unit			\$15,900.00
		TOTAL RIGHTS			\$46,775.00
		TOTAL COST UNTIL GRANTING			\$182,671.20



**Figure 3** Diagram of times and costs in the international phase of a PCT patent.

examination has the advantage that if the invention is favourable, it is automatically accredited in the different countries participating in the Treaty. Thus, when the substantive examination is performed in each of the countries in which the national phase is being applied for, there will already be some advantage as the local evaluators normally take the international examination as a reference when

it comes to coming up with the opinion of the Office of the country concerned. This procedure may contribute to making the local substantive examinations, in each country where the patent is processed, more expeditious.

The disadvantages may be that the costs of the international preliminary examination have to be met, which can be of the order of some \$1000.00 USD. Another disadvantage

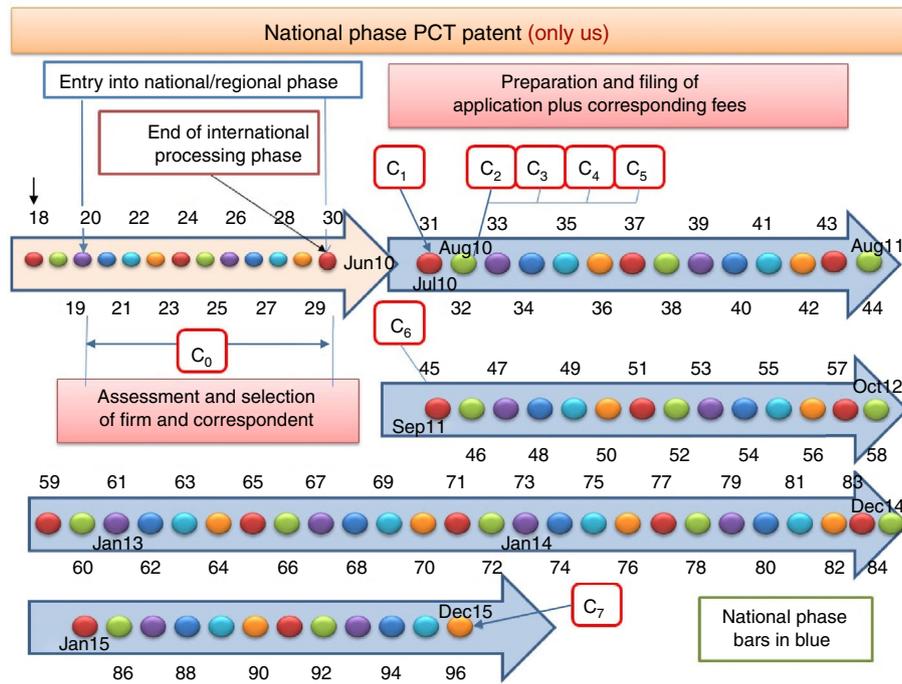


Figure 4 Diagram of times and costs in the national phase of a PCT patent.

is that in the event that there is some doubt on the part of the examiners, the necessary clarification requests will surely be realised and of course this can increase both the costs and the time to finish the international phase, possibly some months after month thirty (30).

### Case 3A: International phase of PCT patent application

Fig. 3 shows the diagram of the international phase for the example of a sustainable energy technology, including the cost points.

The established priority date for this patent was 18/04/2008, the date when the national patent application was filed. According to the provisions of the PCT, the applicant has until 12 months after the date of the first application to submit the application in the international phase. For this reason, and taking advantage of this provision, once the strategy to also patent in other countries was considered appropriate, the international phase of this patent was submitted on 15 April 2009. Table 3 shows the breakdown of costs incurred in this example.

The total cost of the international stage was \$74,584.40 pesos, which is equal to about \$44,661.50 US dollars. The time required was practically two and a half years.

### Case 3B: National phase of PCT patent application

The first country in which it was decided to apply for the PCT patent for sustainable energy technology was in the United States of America. Fig. 4 shows the process cost and time path, and Table 4 shows the cost breakdown of the national phase, considering the application in the US.

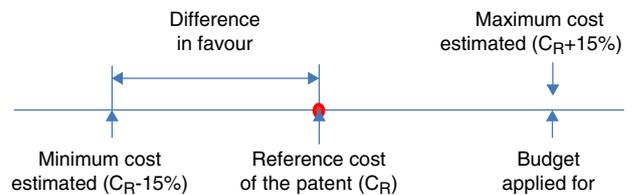


Figure 5 Range of variation suggested for budgeting.

In the National Phase, patents can be applied for in all countries that signed the Patent Cooperation Treaty (PCT), which are more than fifty from all continents. If an approximate budget for intellectual property costs is required for a given project, it will be necessary to add to the \$75,000.00 Mexican pesos (about \$4700.00 USD), from the international phase, approximately \$135,991.00 MN (\$8499.00 USD) more per country where the patent is being applied for.

Of course, in cases where PCT patents are applied for in more than one country, in order to calculate the final cost of the PCT patent, it must be considered that the cost of the international phase is common, so it must be divided between the number of countries in which patent applications are filed in the national phase.

The amounts shown in the tables can vary if there are clarifications or observations to solve, so it is always good to add an additional 15% of the total cost as protection. See Fig. 5.

### Summary of results

The total times and costs required for the different patent projects of the cases exemplified above are shown in Table 5.

As mentioned previously, applying for a patent and following the process until the title is obtained is an entire

**Table 3** Costs of the international phase of a PCT patent.

Dates	Costs (Cx)	Item	Cost	Taxes (16%)	Total
10/01/2008	C0	For drafting of the Technical Report	\$17,000.00	\$2720.00	\$19,720.00
15/1/2009	C1	Preparation of documentation required for its filing	\$6000.00	\$960.00	\$6960.00
15/04/2009	C2	International fee payment for the filing of patent application via (PCT) Swiss Francs \$1330.00 (CHF 15 per sheet above 30)	\$16,718.10		\$16,718.10
29/04/2009	C3	Payment of Transmission Fee for filing patent application (PCT) (with taxes, \$372.25 US dollars)	\$4450.96	\$712.15	\$5163.11
29/04/2009	C4	INTERNATIONAL SEARCH FEES Spanish Office for individuals and corporations EUR \$425.00 (Note there was no translation cost due to having made the search in the Spanish Patent Office)	\$8053.75		\$8053.75
16/12/2009	C5	Preparation of the application for the preliminary examination	\$3500.00	\$560.00	\$4060.00
16/12/2009	C6	Payment of fee for preliminary examination EUR \$560.88	\$11,099.38		\$11,099.38
16/12/2009	C7	Payment of processing fee (EUR \$132.00)	\$2810.06		\$2810.06
		TOTAL EXTERNAL CONSULTANT			\$19,720.00
		TOTAL ADMINISTRATIVE COSTS			\$11,020.00
		TOTAL RIGHTS			\$43,844.40
		<i>TOTAL COST OF INTERNATION STAGE(common)</i>			<i>\$74,584.40</i>

**Table 4** Costs of the national phase of a PCT patent.

Date	Costs (Cx)	Item	Cost	Taxes (16%)	Total Pesos
10/05/2010	C0	Evaluation of proposals, costs and selection of firm in the US	\$3500.00	\$800.00	\$4300.00
01/07/2010	C1	Preparation of the necessary documentation	\$3500.00	\$800.00	\$4300.00
25/08/2010	C2	For preparation and filing of a patent application made by a law firm with associated office in the US	\$12,800.00	\$2048.00	\$14,848.00
25/10/2010	C3	Correspondent fees in the United States of America	\$51,200.00	\$8192.00	\$59,392.00
25/11/2010	C4	Translation	\$1800.00	\$288.00	\$2088.00
25/08/2010	C5	For certified copies	\$313.20	\$50.11	\$363.31
10/09/2011	C6	Management and sending of power of attorney to associated office in the US	\$3500.00	\$800.00	\$4300.00
15/12/2015	C7	Payment for granting the patent application in the US (estimated)	\$40,000.00	\$6400.00	\$46,400.00
		TOTAL EXTERNAL CONSULTANT			\$76,328.00
		TOTAL ADMINISTRATIVE COSTS			\$12,900.00
		TOTAL RIGHTS			\$46,763.31
		<i>TOTAL COST – NATIONAL PHASE IN THE US</i>			<i>\$135,991.31</i>

**Table 5** Summary of costs and times in the three cases presented.

Type of patent applied for	Total cost in Mexican Pesos	Approximate cost in USD	Total time to obtain the title	Notes (OA = Official Action)
Case 1: National	\$54,628.81	\$3414.30	5 years 4 months (64 months)	An OA in the formal exam and two OAs in the substantive exam
Case 2: United States	\$180,208.20	\$11,263.00	2 years 7 months (31 months)	Total cost without official actions
Case 3A: International phase PCT patent	\$74,548.00	\$4659.25	30 months	Only the time to finish the international phase, without considering official actions
Case 3B: National PCT phase	\$135,991.31	\$8499.00	5 years plus six months (66 months)	Total time to obtain the PCT patent (adding the time required for national and international phases): 96 months (approximately 8 years)

intellectual property project, so the first question to answer is: where will the money come from?<sup>28</sup>

Moreover, the time required to obtain the patent titles must be the lowest possible since the exploitation time of the patent will be conditioned to the following equation:

$$T_{EP} = (20 - T_{OP}) * F_{LC}$$

where:  $T_{EP}$  = time for exploiting the patent;  $T_{OP}$  = time for obtaining the patent;  $F_{LC}$  = factor of life cycle ( $0 < F_{LC} < 1$ ).

In other words, from the twenty years of monopoly granted by the government for the exploitation of the patent, we will have to subtract the time required to obtain the patent and finally multiply by the technology life cycle factor, which can vary between the extremes of zero to one depending on how long the technology can be exploited before its competitors launch a more efficient technology or better features into the market.

The value of a patent is not always directly related to its cost. However, when you have an invention, which has high commercial probabilities, you do not have to skimp on the costs of writing since the value of this type of patent will depend directly on the form in which the technical file was written and how the claims have been defined.

The art of patent drafting lies essentially in the claims because in these, the patent lawyer or agent must fully capture the different aspects that are claimed from the invention through words and phrases that have sufficient legal scope and try to cover a very high range of permutations. Choosing a simple word or phrase in a key patent can be worth a lot of money, so its value depends ultimately on the art of writing. It is a mistake to think of patents as a simple, conventional document. Patents, especially good patents, should be seen as custom-built instruments with commercial purposes.<sup>29</sup>

Patents must be exploited or transferred, which will also entail transaction costs. If we consider that the technology market is one where transaction costs are high, another important cost component is the transaction of technology transfer and licensing contracts. Thus, it is critical to

minimise both the cost of obtaining the patents and their transaction costs.

When the transfer of knowledge is international, negotiations require the value of a patent, taking into account the number of claims it has, in order to make appropriate comparisons between patents of the same genre, taking into account the size of the market and of course the number and coverage of their claims.

In these cases the 3C index can be used, which is obtained by dividing the total cost of the patent between the number of claims.<sup>30</sup>

## Discussion

In private organisations, decisions that have to be made about whether or not to apply for patents, what kind of patents to apply for and how much to invest in this process are usually taken with a commercial or business approach; and based on their strategic planning. Of course, public universities are nonprofit organisations. However, through the transfer and licensing of their patents, they can obtain resources to acquire equipment and materials, in order to continue and extend the scope of their research, but above all, the licensing of patent knowledge may contribute benefits to society and boost, to some extent, the economy.

Generally, the aim of a patenting project is to obtain the title of a well-structured, well-covered and well-written patent, so that, in principle, it passes the formal and substantive examinations that will be carried out in the Patent Office and, in addition, be able to resist the possible oppositions, always trying to reduce the cost and the time required to obtain it ( $T_{OP}$ ). Usually a patenting project in public universities is carried out, or at least coordinated administratively, by the Technology Transfer Offices (TTO), or by the Linking Offices. Once obtained, the university patent should be sought transfer or licensing to other organisations in the productive sectors or services of society so that embedded intangible knowledge has an economic and social impact.

For this, the OTT requires identifying potential stakeholders and conducting negotiations and transactions that lead to the signing of the respective contracts.

In the cases presented in this paper, real patenting costs have been obtained, which can be taken as *reference costs* to create budgets for this type of projects. However, when budgeting for intellectual property costs, it is always important to set an expected central cost and take into account that those costs, as well as the end times, are likely to vary by up to  $\pm 25\%$ , or in very special cases, higher percentages of variation. It is suggested that one should, at least as a simple rule, consider a 15% overage when making the budget. See Fig. 5. The variations may be due to many factors, including drops in currency exchange rates, number of observations and/or requirements made by patent offices to be settled, fees of law firms and/or specialists which would have to be contracted, and so on.

When sufficient resources are not available, some people write their own patent and follow their process from submission to filing. In some cases, the available resources are even enough to hire a law student or intern whose fees are low and can possibly perform the process until very advanced stages. The problem is that if obstacles arise later, during the formal examination and especially during the substantive examination, you may regret it. Some specialists think that patenting services are like medical services. Saving now can lead to huge costs later.

Always bear in mind that the *biggest possible cost* that one can face is to have to abandon a patent due to not having the resources to face the costs of additional clarifications. This is a situation that may be possible in private sector companies through bank loans or the use of other financial resources, but in the case of a Mexican public university, solving such a situation is practically impossible, unless there is some interest of a political nature. So, if the budget was not properly implemented, it may be necessary to drop the case due to not finding a source of additional resources to solve the problem.

According to Teska,<sup>31</sup> the costs incurred *in filing* the application for a utility patent in a United States Patent Office are approximately \$12,000.00 USD. When the patent is granted, the cost easily exceeds \$20,000 USD. In general we can say that the cost of a typical patent obtained in the United States of America ranges from \$10,000.00 to \$30,000.00 US dollars. Likewise, the required time goes from one to seven years, with an average time of 3½ years. Table 5 shows that cases 2 and 2B presented in this study are fully within these ranges.

There are other problems related to the high costs of obtaining patents. The first is that the high costs of administrative fees and translation costs discourage small and medium-sized companies from submitting patents, just as they did in Europe. Of course, the issue cannot be resolved simply by reducing the costs of legal fees. Naturally, by extension we may think that this phenomenon occurs in other parts of the world.

Another problem is that high costs encourage the uncensored use of patents as many users may prefer to risk using technology without licensing it, and then seek remedies for infringement if they are accused of it.<sup>32</sup> The consequences are that the costs of patent violation litigation involving

large amounts of money can be staggering. When the amount at risk or in litigation is one million dollars, the costs of litigation through each side are \$350,000.00 USD through the trial and can reach up to \$650,000.00 USD towards the final sentence.<sup>33</sup>

The most important component of litigation costs are attorneys' fees but also expert fees, travel expenses, handling of documentation and production costs; furthermore, the time costs of the corporate lawyer and the staff supporting him/her during the litigation must be considered.

## Conclusion

As is clear from the discussion in the previous section, the process for obtaining patents is expensive and administering patent applications is complicated. Therefore, it requires specialised personnel; in addition, maintaining their obligations and asserting rights causes high costs to both owners and users of the technology.

Undoubtedly, in public institutions there will always be high-quality inventions that meet the requirements that the Industrial Property System requests to grant a patent title. The problem is how to face patenting costs similar to those shown in the cases presented, as this is very costly and the budgets of public institutions are usually limited. So, the way to face the situation is to make good budgets and manage them in advance, so that they are covered through government financing of the projects or by the company or organisation that sponsors the development of the project.

For the reasons stated, managers of public institutions should consider using other intellectual property figures to raise and perform their intellectual protection strategies. Trademarks, copyrights, utility models, designs and industrial secrets may be used independently or in combination, seeking the best mix of intellectual property figures that allow the protection problem to be solved but with much lower costs and times. In the end, everything will depend on the type of technology you want to protect and its business potential.

## Ethical disclosures

**Protection of human and animal subjects.** The authors declare that no experiments were performed on humans or animals for this study.

**Confidentiality of data.** The authors declare that no patient data appear in this article.

**Right to privacy and informed consent.** The authors declare that no patient data appear in this article.

## Conflict of interest

The authors declare that they have no conflict of interests.

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