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PATENTING - A COST MANAGEMENT PERSPECTIVE

Abstract:

Purpose: Patenting continues being a growing market, yet critics see significant inefficiencies between the cost spent on protecting inventions and their economic returns. The purpose of this paper is to examine the value of patenting from a cost management point of view and lay out in detail all costs related to it. This approach is intended to support inventors in deciding whether patenting is the right solution for them.

Methodology: Utilising a quantitative approach, a comprehensive literature review and analysis of scientific research has been undertaken. Together with secondary literature, further economic resources have been reviewed, both on the topic of patenting, as well as cost management, using here specifically the approach of Life Cycle Cost (LCC). Furthermore, interviews with experts have been conducted to verify results.

Findings: Sources prove that a significant amount of patents never recover their cost, yet the annual growth of in force patents reach above 5%. Looking at a business case of patenting an invention from an LCC perspective, the cost for the patent application process and the maintenance of the patent are clear and can be incorporated. Strategic patent management leads to the optimisation of costs, cost reductions and consequently to an increased efficiency of a patent.

Practical implication: Patenting is not always the most cost effective or profit maximising solution. The review laid out in this paper should serve those considering the financial aspect of protecting their IP rights while providing an insight about what type of costs are involved in patenting and how these can be optimised.

Originality/value: This study is meaningful as it details the related costs of patenting, providing a basis for decision making. Costs laid out include those related to the application or filing process, the periodic financial maintenance, as well as the management and administration of handling these processes and partnerships. Costs related to R&D of the invention, opportunity costs and possible risks are further defined, providing a holistic view of the costs of patenting.

Keywords:

Cost management, Life cycle cost, Patent management, Intellectual property

JEL Classification: A22, A23

1. Introduction

1.1. Intellectual Property

Protecting intellectual property (IP) continues being a hot topic world-wide. By definition of the World Intellectual Property Organisation (WIPO), IP "refers to creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce" (WIPO 2022) and include primarily copyrights, trademarks, and patents. For the purpose of this article, we are considering solely the element of patenting. However, it is worth understanding patenting in the context of intellectual property from a holistic point of view.

With an annual growth rate of 5.9%, the market for patents reached around 15.9 million in force patents in 2019 with China showing the fastest growth (+14.5%), followed by Germany (+8.1%) and the U.S. (+6.9%) (WIPO 2021). An annual 3,2 million new patent applications are counted world-wide (WIPO 2020). Of this amount 84,7,% are accounted for by only five patent offices, including China (43,3%), USA (19,3%), Japan (9,6%), Republic of Korea (6,8%) and the European Patent Office (EPO) (5.6%) (WIPO2020). It shows that only a few dominant industrial regions are active in patenting.

Patents are known to be a costly undertaking, but there are also less costly options available to protect IP rights, for instance in the form of utility models, though not available in all jurisdictions around the world. Utility models have typically less requirements and costs and are processed faster than a patent. In return they offer a shorter, typically 10 years protection period. According to WIPO, "of the 2.3 million applications for utility models filed globally in 2019, the IP office of China received 96.9% of the world total – the other 79 offices together receiving just 3.1%" (WIPO 2020). It proves that excluding China, the patent is still a dominant way of protecting inventions.

Once a patent is filed and accepted, the invention is protected for 20 years, providing periodical fees are being maintained. The average length of in force patents in 2020 was in fact much lower than the intended period. For instance, in China the average length of an in force patent lasted 7,6 years (tendency slightly rising), in the USA 9,6 years (tendency slightly falling) and Germany 11,0 years (tendency slightly falling) (WIPO 2021). Once the invention loses its protection it goes into the public domain, available for anyone to use.

Although protecting inventions through patenting is considered a positive measure for promoting the efforts of innovation, it has also faced a great deal of criticism during recent years. Some argue that patenting is providing a temporary monopoly and in fact contributes to slowing down technological progress (Jaffe and Lerner 2004) (Takalo and Kanniainen 2000). It is being argued that patenting can trigger slower innovation progress by the inventors, as these are seeking to exploit the technology until competition forces them to reinvent. It also fosters waiting times for patents to expire. In today's fast evolving age, key technologies in the information technology sector keep changing within very short cycles, so that investing to protect a patent for up to 20 year becomes irrelevant in some sectors. One could further argue that in some cases, disclosing the secret of the invention through a patent, one becomes vulnerable to infringement or to the competition to advance the technology for their benefit.

The trend of open innovation, as promoted by Chesbrough (2006) further holds against the long-term protection of IP rights and encourages the sharing of innovation as a tool of fostering efficient cooperation. Greco, Grimaldi, and Cricelli provide evidence that companies embracing open innovation "tend to improve their industrial and economic performance" (2019).

Further criticism of patenting can be found in the predicated costs. According to Stephen Key "around 97% of all patents never recoup the cost of filing them" (Key 2017). Fisher and Walker

confirm this statistic by stating that “Of today’s 2.1 million active patents, 95 percent fail to be licensed or commercialised” (Fisher & Walker 2014). He continues saying that such unused patents include “over 50,000 high-quality patented inventions developed by universities“, representing a tremendous waste of public and private investments into innovation. These figures may represent an American point of view instead of a wide international perspective, however in the rest of the patent dominated world, this figure may not be much brighter. It indicates that the large majority of patents are not returning the investment. Key further refers to the source Center for Intellectual Property & Entrepreneurship at the University of Missouri School of Law, which underlines the evidence that about 50% of patents are set to expire prematurely, mainly “because their owners decline to pay the required maintenance fees” (Key 2017). Furthermore, universities struggle with funding their patent portfolio and require a strategic approach to managing the portfolio and their cost (Dhoble 2016).

Though patenting according to statistics is still a rising market, critics view it as a cost intensive endeavour, remaining an underused means for commercialising inventions while hindering innovation and leading to many inventions not worth protecting from a financial point of view. The question we face now is: what mechanism helps make the right decision about patenting an invention or not?

1.2. Cost Management

Soranso, Nosella and Filippini refer to Pitkethly’s view that firms compute economic value through methods such as cost-based, income-based, discounted cash flow or an option-price-base (2017). Placing a value on patenting into the current context, this article is looking to evaluate patenting from a cost management point of view. Cost management, according to Gartner Glossary is a tool used in business for “planning and controlling of the budget…” and “… typically focuses on generating savings and maximising profits in the longer term”.

There are a number of strategic cost management techniques used in business. Activity-Based Costing (ABC), for instance is a method of assigning direct and indirect cost to a product and service and focuses on identifying the activities required to manufacture the product or provide the service (Mohan, 2022). Target Costing (TC) on the other hand, first determines the target cost and profit it needs to achieve and works backwards to define how expensive various activities, such as manufacturing, sales and administration need to be in order to make the product competitive (Mohan, 2022). Total Quality Management (TQM) refers to continually improving the manufacturing process, its supply chain and customer experience through improving skills and processes and along reduce costs (Mohan, 2022). A further cost management technique is Life Cycle Costing (LCC) and refers to the total cost of ownership of an asset (Mohan, 2022). According to Barringer et al, „Life cycle costs are summations of cost estimates from inception to disposal for both equipment and projects as determined by an analytical study and estimate of total costs experienced during their life. The objective of LCC analysis is to choose the most cost-effective approach from a series of alternatives so the least long-term cost of ownership is achieved” (Barringer and Weber 1996).

For the purposes of this article, a LCC methodology has been chosen to be the most adequate cost management technique in preparing a value analysis for patents, as patents have a clear end of life. Ensuing, we are looking at the various costs involved in patenting while evaluating it based on the LCC methodology. Cost of acquisition, in this case relate to services needed to file a patent and maintenance costs refer to the upkeep of fees over a longer period of time.

Based on the state described above, we assume that patenting may not be the right choice for each situation and in many cases choosing not to patent presents, from a financial point of view, the better choice. We are aiming to define the various cost points related to patenting while

deriving with a framework for cost management leading ultimately to a conclusive decision on whether patenting is the best choice or not.

The first part of this paper includes a review of academic and non-academic literature on the topics of patent cost and patent management, as well as cost management and LCC. Trends and issues in patenting are being pointed out. Following this, based on the methodology of LCC costs have been categorised and explained.

2. Literature Review

Looking to answer the question of what makes patenting economically worthwhile whilst using the LCC model, an extensive review of academic literature has been carried out. Initial results show that only few recent studies have focused on the cost management of patents. In a title search in the citation indices Scopus and Web of Science the search for “patent cost management” derived only 4 respectively 5 articles. Searching titles for “life-cycle costing for patents” neither of the citation indices revealed any results. Broadening the literature review, further terms have been added, such as “patent management”, “cost efficiency of patents”, “cost benefit analysis” and “patenting strategies”, leading to wider results. Additionally, reviews of cost management techniques have been conducted. Many recent studies have focused on this topic and provide insight into the different methodologies. The LCC method, in particular, was further investigated.

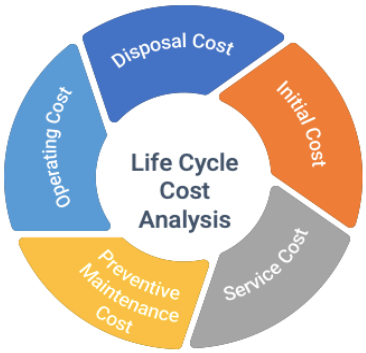
2.1. Cost management and LCC

Understanding the mechanics and theories behind cost management and LCC, academic, as well as economic resources have been looked at to prepare for a clear concept of how to analyse patent costs in the context of LCC.

According to Rounaghi, Jarrar and Dana (2021), to better understand the competitive advantage of a product or service, strategic cost management is implemented during value chain analysis. Furthermore, they considers the strategic situation analysis of structural and administrative cost drivers while looking at cost reductions in order to stay competitive (Rounaghi and Jarrar and Dana 2021). A number of methodologies exist which are connected to relevant accounting systems.

As defined by the Corporate Finance Institute, „Life cycle cost analysis (LCCA) is an approach used to assess the total cost of owning a facility or running a project. LCCA considers all the costs associated with obtaining, owning, and disposing of an investment” (CFI 2022). Figure 1 depicts the costs associated with LCC, namely the initial cost, service cost, preventative maintenance cost, operating cost and disposal cost. This layout has been used in this paper as a framework for categorising all related patenting costs.

Figure 1: Life Cycle Costs Analysis



Source: Corporate Finance Institute

LCC is a method used in accounting and is also presented in form of a mathematical model (WSM 2022). The formula adds the initial costs and the present value of all recurring costs while deducting the present value of the residual value of the asset. The residual value refers to the estimated value of the asset at the end of its life. The asset itself can be a tangible or intangible asset. The formula is defined in Figure 2.

Figure 2: Life Cycle Costs Formula

$$\textit{Life Cycle Cost} = \textit{Initial Cost} + \textit{Present Value of All Recurring Costs} - \textit{Present Value of Residual Value}$$

Source: Wall Street Mojo

The initial cost covers the expenses to do with the application or filing of the patent, the recuring cost comprises those expenses to do with maintaining and managing the patent. The residual value after the 20-year life of a patent or in case of an early laps is expected to be 0, as the asset is no longer existing, and the know-how has been transferred to the public domain. In case the patentee decides to commercially dispose the patent prior to expiry, let's say in form of a sale, the residual value can be greater 0.

2.2. Patent costs

Laying out the specific costs incurring throughout the establishment and life of a patent requires the input of a number of variables. Fees raised by the respective patent offices, (i.e. for filing fees, periodical up-keep) are publicly available and easy to obtain. Organisations, such as the WIPO, EPO or national IP offices will serve as relevant sources. It is worth noting, that different costs may apply based on the type of applicant, such as an individual (cheaper) or an entity (tentatively more expensive) (Dhoble 2016). Costs related to advising functions throughout the patent applications or for the sale of a patent or for drafting a license agreement (i.e., legal advisor) are down to the negotiation and expected workload. Cost for own time spent on (processing?) the patent procedure, (i.e., during the application process and the ongoing patent management) is to be estimated by companies or individuals themselves. These expenses can vary largely based on regional HR costs and time involved.

WIPO and other local IP offices are in addition valuable sources in guiding patentees through cost and cost reducing measures. WIPO, for instance, makes recommendations on managing patenting costs, ranging from the decision about where to file to how to consider strategic abandonment (Andrade and Viswanath 2017).

2.3. Patent Management

Patent management is particularly important when accumulating increasing assets of IP. Strategies need to be developed to deal with the costly assets. According to Soranzo, Nosella and Filippini, "a firm should analyse the legal strength of a patent, the relative importance of its technology field and finally its exploitation in its technology field" (2017). We would further add the element of time, looking at how long a patent is expected to be of importance and how quickly a patent is expected to lapse, based on newer inventions appearing and leading to the patent being an outdated technology. Gaining a first mover advantage in a fast-changing environment may be sufficient to exploit the invention commercially before being in need to develop newer technologies.

Sharing rights to the patent is a further management aspect when considering the economics of the patent. If the firm's strategy of using a sole ownership-based patent is not aligned with the potential of a patent, it is worthwhile considering sharing rights to the patent internationally or across different industry sectors in form of license agreements or international partnerships.

The EPO offers a management tool called IPscore®2.2 for the evaluation and administration of patents (EPO 2022). Specifically, it provides a software which allows for the economic evaluation of the technology in form of a qualitative and quantitative assessment. The tool's aim is to provide evidence of commercial opportunity potential and help exploit it. It further helps discourage those applications without potential value and essentially saves resources for those applicants.

2.4. To patent or not to patent

A review of literature evaluating reasons for patenting brings further insight into strategic decisions behind patenting. Besides protecting intellectual property rights and securing market position from competitors, other reasons do exist. Looking at patenting from a valuation point of view, Raffoul and Brion point out that the value of a company is based on its assets and income potential. Especially in the case of high-tech start-ups with low revenues, a patent for a specific technology leading to potential economic success can increase the valuation of that firm and attract investors (Raffoul & Brion 2011). Therefore, patenting, and it's creation as an asset for the company, is a strategic decision in acquiring funding and serving as a security for banks or VCs.

Patents can further offer sources of income, even if not utilised internally. The sale of patents or licence agreements can generate an attractive income, even if a company is no longer active (Raffoul & Brion 2011).

Maresch, Fink, and Harms demonstrate in their research that the competitive environment is relevant when considering a patent strategy (2016). They argue that only if there is competition in the field of the invention, a patent protection has relevance. Otherwise, the risk of imitation is low, and a patent has no relevant economic impact. Their study shows that a patent contribution to a firm's economic performance increases with an increasing competitive environment and the more recent a patent is.

Strategic management in reducing cost seems largely overlooked within the patenting process. If we follow the statistics mentioned earlier, between 95-97% of all patents (in the USA) never recoup the cost of filing them, then the question arises why in fact such a large amount of funds

is being spent on patenting. Mismanagement between R&D and its commercialisation seem one obvious answer. But also, the marketability of the future patented innovation seems to be largely overestimated. A realistic view of chances in the market should be one indicator of whether patenting makes financial sense.

3. Methodology

The purpose of this study is to lay out in detail costs that are, from the point of view of the inventor, associated with patenting during its life cycle and provide insight to those considering investing into patenting. The research is looking to answer which direct and indirect costs are involved, but also provide an overview of other types of costs, such as sunk costs, opportunity costs and unforeseen costs due to risks.

The methodology of this paper follows four steps. Firstly, an overview of the current situation, as well as trends in the IP sector and, in particular, in the area of patenting has been researched based on secondary and economic literature. Specifically, the element of patent costs, cost management and strategic reasons for patenting have been in focus while researching literature.

In the second part, the concept of cost management has been researched to derive with a model for the purpose of defining the cost of patenting. Both a scientific approach as well as an economic approach have been considered. The LCC analysis in particular has been reviewed and applied to the asset of a patent. Both the elements of LCC Analysis (management approach) and the LCC formula (mathematical approach) have been taken into account.

In the third step, through both a quantitative and qualitative approach, the phases of filing and maintaining a patent have been laid out along with the type of costs. Not all of the costs defined are applicable under the LCC approach, however, these give additional insight into the value of a patent and can support a decision of whether to file a patent based on a LCC approach. Furthermore, the relevant cost categories for the LCC approach have been defined and described.

Lastly, alternative solutions to patenting or cost optimisations throughout the patent process have been considered while keeping the cost-reducing nature of the LCC method in mind.

4. Results

In the following section, all relevant costs related to patenting have been laid out. They include direct and indirect costs according to the LCC Analysis (WSM 2022), but also provide an overview of other types of costs, such as sunk costs, opportunity costs and unforeseen costs due to risks. While keeping in mind the principles of LCC, they provide alternatives, namely generating savings and maximising profits in the long run.

4.1. Sunk cost

Investment into R&D leading to the invention to be patented are considered sunk costs. They have been incurred and are not recoverable. From an accounting point of view, they are separate from the patent costs. However, this cost can serve as an important indicator when deciding for or against a patent. No recommended cost ratio of patenting cost vs. research & development cost exists and that figure would largely vary based on the different technology fields. Experts, nevertheless, suggest that filing and maintaining a patent should cost less than the R&D of the invention. While keeping in mind a realistic chance of commercialising the

invention, the patentee needs to evaluate the invested cost of the invention and weigh it against future cost for protecting it.

4.2. Initial cost (one-off cost)

Costs incurring only once and in particular during the application period consist of primarily own time spent and application fees. The application period is estimated to take at least one year but can take up more time, provided an invention is declined and hence corrected or challenged. Whilst during this stage contemplating cost reductions, it is wise deciding which type of patent to go for. Cost saving patent options include provisional patents, petty patents and utility models (Kalanje and Jaiya 2006) as they are less expensive to file and can provide a cost-efficient alternative. Considering local patents over international patents is a further cost point to consider. Options, as frequently seen in university patent strategies, are to first apply for a local patent and upon granted success expand internationally if proven commercially viable by the inventor to authorities.

- Costs for own time spent on filing a patent is often overlooked. This cost can include the individual inventor's time or that of the staff of a company or of a patent office of Higher Education Institutions (HEIs) involved in patenting a new invention. Time spent involves for instance, the preparation of documentation for a patent application, selecting and coordinating related advisors and managing and administering the lengthy process of the application.
- Application filing fees cover the fees for submitting the application to the respective patent office and for the office to examine the application. These fees depend on the type of patent (i.e., provisional or non-provisional patent), as well as the international reach (i.e., home country vs. European patent or international patent (Patent Cooperation Treaty (PCT)). Filing a provisional patent (priority patent application) first and then pursuing an international equivalent helps in delaying or reducing fees. Under the Paris Convention, the right of priority secures the first date of application of a patent for all their contracting states for the period of 12 months (WIPO 2022). During this period, the applicant can improve the application, search for partners, and think about the international reach for their business case.
- Granting fees are raised by some regions once a patent is approved, such as the EPO, but also patent offices in the USA and China.

4.3. Service cost (one-off cost or recurring)

Service cost refer to those costs incurred by service providers throughout the life of the asset. In the case of the patent application, they can include:

- Legal advice for this complex process is in almost all cases advisable. An in-house legal team may be used partly or in full. It is recommended to always consult external patent agents or intellectual property legal advisors. Costs can be agreed as a fixed sum, on an hourly basis or a combination of both. It is always advisable to refer to an expert helping to avoid spending additional time in the process and committing errors along the way. Higher legal costs can result in lower resources of own time spent in the process.
- Patent search is one crucial initial task to be carried out by a legal advisor or oneself. This task is extremely critical due to technical and legal terminology often hidden in the patent descriptions and is often carried out by an expert. National and international databases will need to be researched and evaluated, taking up a substantial amount of time and cost. In particular, when aiming for an international PCT, it is worth considering the costs of different search authorities, as different costs may apply. Such institutions

are for instance, International Search Authority (ISA) and International Preliminary Examining Authority (IPEA).

By early research of patent databases prior to completing the R&D process may help reduce cost and avoid the unpleasant surprise of finding patented technology after a lengthy and costly development.

- Translation fees paid for the interpretation of complex technical documentation into other languages for international patents needs to be considered. It is advisable to weigh the translation fees vs. application and advisory fees related to international patenting. Applying for an international patent in one language (i.e., English) may amount to lower costs than applying twice, first locally and then internationally while incurring additional translation fees.
- Management fees paid for an external service provider taking on the role of managing the patent application, in case it is not intended to take place in-house. For inexperienced patent applicants this may present a time and cost saving alternative offering the learning of the processes for internal application management in future.

4.4. Preventive maintenance cost (recurring costs)

Preventive maintenance cost aims at reducing overall maintenance costs. In regard to patenting, this can be done through means of strategic management which can reduce maintenance fees beyond the added value of the patent. A management strategy can support the effective administration of patent portfolios.

- Management fees need to be considered typically in regard of own time spent but can be considered as an external service for keeping control over periodical payments to avoid loss of patent and to review the option to lapse a patent.

4.5. Operating cost (recurring)

Operating cost is a recurring cost and arise once a patent is granted. Over the period of up to 20 years of the life cycle, these costs can add up to a substantial amount and should not be overlooked. In case the patented technology is not actively generating income, this cost can be a serious financial burden to the patentee.

- Maintenance fees refer to the periodical financial upkeep of the patent, which tend to be of incremental value and typically occur annually, or once every few years (i.e. US). It is wise to manage cash flow needs for such fees, especially when the patent does not generate own income.
- Costs related to preparing license agreements, or formal partnerships requires further investment into drafting adequate agreements, as well as managing and administering this process.
- Managing obligations and receivables of license payments, partnerships and the like generate further recurring fees associated with patenting, which are typically held in-house.

4.6. Costs related to risks

During the holding period, costs related to risks may arise.

- Litigation costs in case of infringement can arise to an unforeseen amount. It is well worth considering, when defending a patent, whether litigation makes financial sense. Different interpretations of the patent and unsatisfactory financial outcomes in terms of

litigation compensation and cost can occur. Also, the risk of challenging a granted patent by another party may occur, which can further accumulate unforeseen costs. These costs are challenging to calculate in an LCC analysis, nevertheless, different scenarios may be prepared in case of an event.

Further costs to consider both during the period of patent application and the granted patent.

- Although not considered an accounting cost, one should keep in mind the opportunity costs of spending resources on the patenting process vs. pursuing other opportunities with the same resources. Could, for instance, more income be generated pursuing other opportunities? Could one enter the market quicker and gain a first mover advantage vs. spending a long time on the patenting process? This thought is particularly relevant to the fast-changing information technology field, where a lengthy application and a 20-year patent life will not suit a top-level invention.

Disposal costs refer to the termination of the asset. In the case of a patent, this may include a sale, early lapses or natural lapses after 20 years.

- Transferring the patent by selling a patent requires further investment for the drafting of respective agreements, as well as managing and administering this process.

- Letting a patent laps by discontinuing the maintenance fees or letting it expire after 20 years presents no cost to the patentee.

The following Figure 3 summarises the types of costs related to patenting, while highlighting the cost related to the LCC analysis.

Figure 3. Summary of costs related to patenting and the LCC analysis

Product stages	Prior to patent application	Patent application						
Type of costs	Sunk cost	**Initial costs**			**Service costs**			
Activities	R&D	Own time	Application filing	Granting	Legal advice	Patent search	Translations	Management
Description	Cost for developing the inventions into a patentable asset	Cost of own time spent preparing the document-tation for a patent application and managing the process	Fees paid to the patent office for the application of a provisional or non-provisional patent	Fees for granting a patent, depending on the region, additional fees may apply (i.e.. EPO, USA, China)	Fees for a patent agent or legal firm representing the patentee in the process of the application	Fees for researching the relevant patent databases, whether a relevant patent has already been filed	Fees paid for the translation of document-tation for international patents.	External provider for application management

Product statges	Patent granted				During patent application and granted patent		End of life of patent	
Type of costs	**Preventive maintenanc e cost**	**Operating costs**			Cost related to risks	Opportunity costs	**Disposal cost**	
Activities	Management	Maintenance fees	Management	Licencing / Partnership s	Litigation	Resources to be invested elsewhere	Transfer of patent	no specific cost involved
Description	To keep control over periodical payments to avoid loss of patent, review the option to laps a patent, and manage licence agreements.	Fees for periodical financial upkeep of the patent	Managing licence agreement, partnership, etc.	Costs related to preparing licensing or partnership agreement or the sale of the patent incl. legal, admin.and mgmt. costs	Litigation cost in case of infringement may arise. Unable to assessed within a cost analysis, as its occurrence and amount are of high uncertainty.	HR involved in the patent process and financing the patent over pursuing other opportunities	Costs related to the sale of the patent include the preparation of sales agreements and related admin.and mgmt. tasks.	The patent lapses by discontinuing the maintenance fees or naturally after 20 years.

Source: compiled by the author

Costs identified for the LCC analysis

Costs not identified for the LCC analysis but relevant for the decision making of patenting

5. Discussion

From a pure cost management point of view, LCC provides a clear breakdown of initial and recurring costs and can support making a business decision in terms of a cost - benefit analysis. Options helping to reduce costs of the patent process exist and should be carefully considered. A clear patent strategy and a defined management approach can further help reduce costs in the long run.

Besides costs identified under the LCC method, additional costs (sunk costs, opportunity costs and cost of risks) can further help evaluate a decision for or against patenting. These costs can play a determining role when deciding to file a patent and how to manage it.

The applicant will further need to assess the value of spending own time vs. paying for external expert services. An inexperienced applicant may be better off using experienced legal services for most part of the application, simply to avoid making costly mistakes and instead learning from experts for future patent filing. Processes, deadlines, technical descriptions and wording play an important role during the application. Not having chosen the correct phrase, limiting the application of the invention and making mistakes in the processes can be costly and timely.

Patenting costs can be considered relevant when considering the income potential of the invention. With a sound commercialisation strategy and clear understanding of the market potential, as well as manufacturing, sales and marketing aspects, even a high cost of a patent can result into financial success. Primarily those inventions with unclear commercial strategies, become a cost burden for the inventor. We therefore conclude that inventing with a commercial perspective and sound understanding of the market stands a better chance than inventing for the sake of inventing.

The immense inefficiency of turning patents into commercially successful products is a factor playing an imperative part in cost management. One must understand that a patented technology does not guarantee success in the market returning profits beyond a sizable investment. A clear assessment of the marketability is highly recommended to be carried out prior to any investment into the patenting process.

Limitations of the study can be found in the non-specific amount of the various costs involved. Such costs, however, cannot be generalised due to the many different patent scenarios and will need to be worked out on a case-by-case basis. A number of factors play an important role for determining the costs and include:

- Type of patentee (individual vs. entity),
- Type of industry sector (pharmaceutical company with high development costs but long-term vision for patents vs. a technology company in a highly innovative ecosystem),
- Strategic reasons (a start-up seeking high valuation through a patent vs. a global enterprise vs. a university seeking protection of their invention for technology transfer)
- Territorial protection (national vs. international protection)
- Length of protection (full length of 20 years vs. early lapse of patent)
- Type of patent (patent vs. utility model)
- Service fees from external legal or management firms (regional costs vary largely)

A further aspect within this study not given much consideration is the nature of the inventions. Though not considered relevant for purposes of this study, some inventions require additional investment for market certification. Looking for instance at inventions within the pharmaceutical or medical technology sector, product releases require complicated and often costly

certification procedures. Within the EU, the European Medicines Agency's (EMA) and the Medical Device Regulation (MDA) are governing and regulating such procedures. In the USA, the equivalent is the Food and Drug Administration (FDA). Such costs further add significant expenses to an invention. Other sectors may follow equally high regulations, others may not. Yet, this is a topic to consider when evaluating the total cost of an invention.

6. Conclusion

In order to support the decision making about whether patenting makes financial sense, this study defines all relevant costs associated with this process and critically looks at options for cost reductions based on the LCC method.

From the LCC point of view, primary costs include initial cost, service cost, preventive maintenance cost, operating cost and disposal cost. In terms of patenting, these costs translate into cost of own time spent, cost for advisory and management services and various fees paid towards the IP office. From a business perspective, these costs can be clearly planned and controlled.

We conclude that patenting is not the right choice for every invention and in many cases not having chosen to patent would have been the better financial decision. Other decision factors other than costs play a role, too. Patent portfolios need strategic management in order to stay financially manageable for the inventor. These, in line with commercial strategies, whether commercialisation through own efforts, in partnership or in form of licence agreements, need to be considered prior to going through the costly process of protecting IP rights.

Depending on the type of patentee (individual, corporation, start-up or Higher Education Institution (HEI)), the patentee may choose a different strategy for protecting their intellectual property rights. Cost will play an important role but is not the exclusive factor. Nevertheless, considering the large amount of unrecovered cost for patent protection, one can only advise the future patentee to consider a solid business approach with a clear market chance when protecting one’s invention.

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