

# **Effects of Patent Policies on Innovation**

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## **Introduction**

The goal of this paper is to study the effects of patent policies in the process of innovation. We will analyze mostly the effect that government and industrial policies have on motivating contractors and employees and how these policies can be improved to promote innovation. The policies investigated include employment agreements, monetary rewards and regulation policies among others. In addition, we will compare the patent policies of the US to those of Japan and Australia. Emphasis will be on what kind of incentives the policies provide and their effects on creativity and innovation. Finally, suggestions are offered on how to improve patent policies and general government policies to manage intellectual property and promote Research and Development. Before starting the analysis, a section on background information is offered to help understand what kinds of policies exist in the United States.

## **Background Information**

“Inventorship and ownership of a patent are separate and distinct issues.” [1] Although common sense tells us that if someone invents a product or comes up with an innovative idea, he or she should be the sole owner of the patent, there are many cases in everyday life that cause us to differentiate between the inventor and the owner. It is legally valid to grant someone the ownership of a patent by means of a contract or agreement, but the more interesting and complex cases are those in which the ownership of a patent is not clearly defined and could be granted to an entity, generally a corporation or university, instead of the inventor.

There are, in fact, several different cases in which the ownership of a patent is in

question. The simplest case is when an individual uses a shop that is not owned by the inventor and he or she is not an employee of the shop. This is classified as simple since the inventor is only using the facilities and is not being paid by the shop to use its machines. Most complex cases, though, arise when an employee develops an idea or product using company resources. The differentiating factor lies in whether or not the company is paying the employee to develop new ideas or products in the same area as the patent in question. Another common case is that of universities since it is an intellectual environment that promotes new ideas and has the facilities for the development of these. The latter case is also divided between students and professors, since students may inquire professors and receive help from them, but they are not paid to develop new ideas or products. This case is also complex since each college has its own policy regarding patents resulting from work in its facilities. [3]

### **Shop rights**

As a general definition, a “shop right” is given to a person or entity that provided the facilities so that the inventor could develop his idea or product. As stated by Eisenberg, “In such cases, employers are entitled to a 'shop right,' by which the employer receives a royalty-free nonexclusive license to use the invention during the term of any patent that the employee might get for the invention.” [1] In this statement, an employer is defined as the owner of the shop that was used to develop what is being patented. This case could be considered as the “simple” case since the employer (as previously defined) clearly does not pay the inventor for developing the idea; the employer merely provides the resources for the inventor.

The following example found in Rines' *Create or Perish* will allow a better understanding of "shop rights." A man is employed by a certain employer. His job description does not include inventing or developing new ideas or products. However, in the event that he creates an invention and "uses his employer's facilities and the services of other fellow employees to perfect this invention," [3] the ownership of the invention then comes into question. In this case, the employer has a "shop right" since he contributed resources to perfect the invention, so "the employer acquires a nonexclusive, royalty-free, irrevocable, personal license to use the invention himself." [3] The employer cannot pass this license to anyone else and the ownership of the invention is still property of the original inventor. The employer, though, can make the invention for personal use and use it royalty-free.

There is, however, a special case that can be found in the case of "Teets v. Chromalloy Gas Turbine Corp., 38 U.S.P.Q.2d 1695 (Fed. Cir. 1996) [in which] the Court dealt with the invention of a hot forming process (HFP) for hard coating the leading edge of composite fiber turbine blades for the use in commercial jet engines." [5] The Court decided that there exists a case in which an employer that was hired for a general purpose but that was "assigned to a specific task of developing a device or process, he may still be required to cede ownership to the employer of any invention which results from the task." [5] It was defined as an "implied-in-fact contract of assignment." [5] Thus, even though a company hires an employee for a general purpose, if the company can prove that the employee works in a task that is specifically geared towards developing an invention to solve a particular problem, then the employee must then grant the ownership to the company that was paying the inventor to create a solution.

## **Industrial Employment Agreements**

In most engineering companies, there is an Intellectual Property policy that each employee must sign that will grant the company the ownership of any invention that its employees make. A real world example of this is the policy of Raytheon which follows.

When an employee joins the company they have to sign the agreement 'Inventions and Other Intellectual Property'. This states that: All Raytheon Intellectual Property is and shall remain the sole and exclusive property of Raytheon, unless expressly released in writing at Raytheon's sole discretion. "Intellectual Property" is defined as inventions, Raytheon proprietary information, and matter subject to copyright. This agreement also requires the employee to "execute all documents requested by Raytheon for filing and prosecuting such patent applications as Raytheon may desire covering Inventions."

In addition to the agreement the employee signs, we also have an Intellectual Property policy which provides some explanation as to why the company claims patents and inventions of its employees: protect the company's investments of large quantities of manpower and facilities in the generation of various types of intellectual property, which although intangible in nature, have very tangible values, frequently far in excess of the cost of producing and protecting them. [4]

As seen in this message, companies try to protect their investments in Intellectual Property as much as possible. Some companies, such as the Radio Corporation of America (RCA), employ different methods of retaining valuable patents developed inside

the company; “RCA requires that even if it employs a person in an occupation where he is not expected to invent, and where there is normally no obligation to assign inventions, RCA obtains rights under two exceptions: if the employment is under a government contract, and if the work is intended to lead to granting of a government contract” (p. 78).

[3] Thus, there must exist some sort of regulation from the companies so that companies can earn capital from the intellectual property they invest in.

The problem with most employer-employee agreements is that inventors feel like they are not being rewarded for their innovative work. This is a big problem for a country such as the United States of America since throughout the years; innovation has been one of the driving forces of the economy. This lack of motivation is restricting our progress and must be dealt with if we want to continue our advancements in all fields, but particularly those who have distinguished the United States around the world.

### **University policies**

It is important to note that, although similar, most universities in the United States have different patent policies and each should be treated as a separate case. According to Adelman, regarding University policies, “... rights would be shared; all of this is now essentially governed by contracts.” [4] He then goes on to state that the shop right, or “the hired-to-invent doctrine”, are taken as default if there is no contract, but most universities today follow a contract that defines what procedure to follow regarding patents and inventions. [4] Continuing will be a case study of two universities as discussed in *Create or Perish* so as to gain insight into the differences between patent policies in universities in the United States.

First, the case of Harvard University; their policy follows that of general law, “that a student or a professor is not employed nor given facilities for the purpose of invention, and so any inventions that he may make become his own property, which he may do as he desires.” [3] However, during the time of President Lowell, a decision was made to modify the patent law, and now it is mandatory that patents primarily in the field of public health or therapeutics be submitted for approval to the President and Fellows of Harvard College. [3]

Another divergence from general law comes in the field of government contracts with Harvard University. Under government contract, any invention that is first thought up or actually fabricated and put to use by any employee or person affiliated with Harvard is bound by the government's policy of “subject invention.” The right to “subject invention” gives the United States' government “irrevocable, nonexclusive, nontransferable and royalty-free license to practice, and cause to be practiced by or for the Government throughout the world.”[3] In other words, while the employee maintains the commercial nongovernmental rights to his or her invention, the government is free to reproduce the invention and all of the data and designs necessary to create the invention without interference from the inventor. Should the inventor choose to do so, he or she can file a patent application within eight months of conceiving the idea or he or she can allow the government to do so.

The next case will give the contract used in the Massachusetts Institute of Technology. MIT has a slightly different policy; “it concurs with Harvard only to the extent that inventions or developments made by the staff members, and not related to any Institute program of research with which the members may be concerned and to which

the Institute does not contribute any funds,” shall be property solely of the original inventor. The creation of the invention will not change the salary of the inventor. [3]

As seen with the past two examples, each university has its own patent policy and has to identify the trade-offs that will increase productivity and promote innovation and progress. Due to the different natures of the individual universities, there is no single patent policy that will promote innovation for every university. Some, like MIT, are known for the vast amounts invested in research and have to be conservative when rewarding inventions, while smaller colleges could promote innovation by investing more for awards given to students or professors who create new ideas or products.

#### **Atomic Energy Commission (AEC)**

As with most other cases, if the “employer” is the United States Government, all the rules still apply since the US Government is considered like any other company. One of the most notable exceptions is those inventions in the field of atomic energy. “It will be recalled that the law prohibits the granting of patents in the field of atomic energy when those patents relate primarily to the production of fissionable material, processes, or instrumentalities used in the production of such material, or in weapons themselves.” [3] Also, the AEC retains the right to define the owner of an invention if the Commission paid for part or all of the work. Even if the inventor funds his own work under an AEC contract, the Commission has the right to a “nonexclusive, irrevocable, royalty-free license under said invention, discovery, and application for patent.” [3]

Since the problem this paper is focusing on is the promotion of innovation, the

remainder will discuss with more detail the problems that arise in government agencies and with contractors, which are causing employees to reduce their creativity. These cases are more interesting since the company or governmental agency must define its patent policy with some trade-offs in order to promote inventing and creativity while still being self-sufficient. Cases where productivity is being compromised, due to these policies, shall also be analyzed.

### **Government and Industrial Patent Policies**

As argued by John Stedman, the importance of government patent policies relies in that research contracted by the government is important to the general welfare of our nation. [6] That is why we will first look at government policies and the consequences they have on invention growth. Consider that the possibility of owning a patent adds an incentive to the contractor to be creative and the denial of patent rights may cause qualified contractors to ask for higher compensation from the government or reject the work altogether. From this statement it seems that the first issue to be addressed is whether it would be better, for the public, if the government adopts a license policy or a title policy.

Under a license policy the rights of the invention remain with the contractor, where as under a title policy the government would own the patent. Under a license policy the contractor can deny the use of the invention to the general public or require high prices that only a small sector of the population could afford. On the positive side, a license policy would be an added incentive for the contractor to be creative and dedicated to the project. It could also motivate the contractor to accept the work for a lesser

monetary compensation because of the possibility of receiving full royalties from the invention. The government would also save money in litigation processes, if any were to occur, because the contractor would be responsible for defending his patent. On the other hand, a title policy would benefit the general public by making the invention free to use and such usage would promote other scientists and inventors to do additional work on the field. The drawback would be that highly qualified contractors would refuse to work under the title policy or demand more money in doing so. Even after asking for more money, they would have no incentive to give that extra mile in the project because they would not see the same benefits as under the license policy.

Deciding which policy would result in the greatest net benefit to the public is not in black and white, as different projects have different characteristics. The level of incentive that the patent policy should play depends on the difficulty of the invention and the risk associated with it. The size of the contractor also affects how much incentive it requires from the patent policy. Individual contractors and start ups may not be willing to commit to a large financial risk without the possibility of earning royalties from the invention. On the other hand, they could have financial problems in applying for a patent and defending it if granted. Yet another consideration that we should take into account is the possibility of change once a policy is determined. Contractors are likely to fight for a policy change if it perceives it as disadvantageous. Government agencies, on the other hand, rarely evaluate the benefits of an approved policy and thus are less likely to change a policy that is disadvantageous to the public.

There is also an indirect consideration that affects the choice of patent policy and that has to do with costs associated with deciding who should own the patent. When

dealing with a contractor who has made a patentable invention, government must decide if the invention followed from the job description of the contractor, whether he used government sponsored resources and what portion of the invention should go to the contractor versus the government. All these investigations cost money, which is ultimately paid by the general public.

What all these considerations suggest is that deciding what type of policy would be most effective requires careful and individual evaluation of each situation. Each situation should be evaluated to determine if awarding the patent to the contractor would be an incentive for good work, determine if free usage of the invention would foster competition and further research on the topic, determine if the policy is flexible enough so that all parts involved can modify it if necessary and determine how the cost and time of reviewing who should own what. Based on these evaluation criteria, let us now turn our attention to what kind of legislation would be effective. Some of the suggestions are derived from bill H.R. 8596 and were initially proposed by John Stedman. [6]

Stedman calls for the ability of the government to assign patent rights to the contractor when in the best interest of the public, a flexibility to modify an agency's action in order to benefit the public, reducing the amount of supervision needed on the contractor's job and minimizing the review requirements of an agency. Stedman also suggests that the contractor should have the responsibility to prove why he should own the invention (not the government show why the contractor should not), that a board of review should be created in every agency to competently review patent claims from the contractors and that bureaucracy should be kept to a minimum in dealing with matters of invention.

Another important issue on government policy is that of regulation. While government policy on regulation may not be directly related to the patent policy, it does affect innovation. This is of special importance if we consider that more than half of all research and development funding comes from the government. Controls and regulations imposed by the government serve important quality assurance purposes, but some intentionally or unintentionally limit the innovation process. Regulatory agencies are concerned primarily with establishing safety standards. It is well known that some control policies, such as those for cleaner air exhaustion in manufacturing plants, increase the price that the public has to pay. There is also not so well understood cost on innovation growth.

One reason for the negative effect on innovation is the determination of capital and equipment resources. Scientist and engineers are often re-allocated to work on a project required to meet a given standard. Funds are also re-allocated to buy the equipment that is specified by the regulatory agency. Inventors are thus limited in the scope of their research and new technologies often are not tested because of the imposed regulations. Regulations also increase the expected time of income return. Perhaps the best example of this is the FDA. Stricter drug regulations are essential to the creation of safe medicines, but have significantly increased the average time to bring a drug into the market from two years to ten years. Companies are less willing to invest on a product if the expected time of investment recuperation is so high. A third reason why regulation limits innovation is that uncertainty reduces incentive to innovate. Once a product or process has being approved, many companies are not willing to change it because of the risk of rejection and prolonged periods of evaluation. Many firms then opt for low risk

projects and innovation is discouraged.

Despite the adverse effects on innovation, regulatory standards are needed to protect the wellbeing of the public. The government should analyze each regulation to compare its social benefits with its next cost (economic and on innovation). One way to reduce the cost of regulation policies is to establish a minimum set of standards but not enforce detailed instruction on the technologies to be used. Rather, economic incentives can be given for the most innovative process that meets the standards or for the innovative process that best surpasses the minimum expectations. Special consideration should be given to agencies that relate to natural security, as the research that stems from such agencies is of vital importance to the wellbeing of the public. This leads to the next topic of discussion, which is a detailed study on the effects of the patent policies of the Department of Energy.

The discussion on the patent policy of the DE is based on a report issued to the President of the United States on 1976. [7] Unfortunately, given the date of the report it is not possible to fully asses if such a policy had detrimental effects on the agency's ability to reach its goals. A newer version of a similar report was not found while doing the current investigation, but a study of such a report would be a great improvement for a future investigation on the topic of government patent policies. Despite this limitation, the findings contained in it will shed some light to the implications that a particular policy can have on government agency's ability to reach its goals.

The patent policy of the US Energy Research and Development Administration, which later became the Department of Energy, awarded the government the title to resulting inventions. Only under certain conditions could the agency waive those rights

to its contractor. In order to assess if the policy would benefit ERDA's research goals, small businesses, large companies, universities and non-profit organizations were interviewed. Industry representatives overwhelmingly preferred a title policy that would award contractors with patents for their inventions. Companies indicated that a title policy would motivate the most skilled and advanced firms to fight for ERDA contracts. Companies also indicate that they would incur in marketing costs only if granted the patents to their inventions. Opinions were divided about whether ERDA's policy was flexible enough to satisfy their requirements. Some representatives expressed reluctance because ERDA could exercise the right to waive the title of a patent at its discretion. Other mentioned that it would take too much time to negotiate an acceptable contract before starting to work for ERDA.

The academic community uniformly expressed that ERDA should allow universities to retain the title of inventions made under an ERDA contract. University representatives indicated that their institutions have a good record of making their innovations available to the public but needed title rights to accomplish this. They argued that royalties received for government funded innovations are used to further expand their research.

Another issue considered on the report was that of background patent rights. ERDA suggested that it should obtain the patent title of inventions previously made by the contractor when they related to a patentable new idea under ERDA contract. This provision was not included in the government acts that created the patent policy and thus many companies expressed concern that this would make contractors reluctant to work for ERDA. The agency however claimed that the background patents provision was

important to assure that its goal of rapid widespread commercialization of innovations is met. The study concludes that a flexible policy is the best option so that compromises can be reached on individual bases. This, however, represents considerable time delays in the negotiation of contracts.

A study was conducted to assess what impact compulsory licensing would have on the private sector. Compulsory licensing limits the contractor's benefits from exclusive use of the invention to a reduced royalty income. Thus, compulsory licensing would reduce the contractor's incentive, but non compulsory licensing presents the possibility that the contractor keeps an important discovery from public use. The results of the study were not available at the time of the report, but the question raised by it presents another important issue that can be examined in a future investigation. It was suggested, however, that detailed legislation be approved to award satisfactory and consistent monetary compensations to inventors who contributed to energy field.

For the remaining of this section the discussion will be shifted to the industrial sector. Specifically, we will look into the impact of patent policies on industry innovation. The discussion is based on the observations made by Arvid Zuber, John Sutton and Arthur Nobile.[8-10] Consider first a patent policy based on the notion of keeping inventions as trade secrets and thus not divulging information even if a patent application is filed. Such restrictions would prevent an inventor from obtaining exposure in his field and could allow his peers in other companies or institutions to publish work that he has already discovered.

The opposite type of policy, based on the idea of filing an application for any potential innovation, could also have unwanted effects on creativity and incentive.

Workers would be reluctant to share information with coworkers and individualism would dominate over group efforts. There would be an unhealthy competition within the company to for funding and resources. Creative workers would have to deal with this level of bargaining and competition and could find the work environment to be non-inspiring. When it comes to monetary awards for inventions, careful considerations must also be made. If monetary awards are given based on the impact of an invention on the company's revenue and if workers are assigned to a project by management, then workers would not be encouraged to innovate and be creative but rather to land on the largest projects. This could mean that workers would be discouraged from working in a project that they like or could make the biggest contribution in order to earn the monetary reward.

An interesting issue on employment-employee agreements is to determine what kind of compensation is just. Many companies have agreement forms that require employees to waive ownership of their inventions. In return, most companies give fix compensation to the workers. The issue is whether it is better to treat all inventors alike or if doing so only promotes mediocrity. In companies with hundreds, even thousands, of patents usually a handful of those have great impact on the field. Should the inventors of that handful of products receive special distinction? What incentive is there for an individual to be creative and excel if he/she will have no recognition or reward for doing so? It is the inventor who should get rewards and recognized for his/her creativity as intended in the constitution. Employer-employee agreements that eliminate this right go against the notion that patents should promote progress of the useful acts.

On the same issue of employer-employee agreements, Arthur Nobile beliefs that

employment agreements should make a distinction in the scope of work and level of compensation between two kinds of inventors. Workers with novel ideas and a creative mentality should be classified in one group. This group should work in informal setting and be allowed to and encouraged to pursue individual research of their interest. Any inventions that stem from this group should be awarded to the inventor and/or special recognition should be given. The other group of inventors works on more structured project and under more supervision. Those inventors should work in a team environment headed by a manager. Inventions that stem from that group should be attributed to the company even if additional rewards are given to the group's members. The reason for the distinction is that many novel inventors opt for the more informal and encouraging work environment of small companies. Studies have shown, for example, that from 1946-1955 more than two thirds of all major inventions came from small companies and independent inventors. Another study by John Jewkes identified 61 important inventions of the 20<sup>th</sup> century and found that more that half of those stemmed from individuals and small companies. If large companies want the same level of result, then they should make an effort to simulate the work environment enjoyed by inventors in small firms and independent inventors.

### **Industry Incentives**

In this section we would like to readdress the issue of compensating employee inventors. In doing so, we will determine the type of compensation to be awarded to an employee inventor by exploring different alternatives and examples. We will begin our analysis by considering Japan's recent policies on compensation of employee inventors.

Both the United States and Japan have a patent system which is intended primarily to promote innovation, and not to directly reward inventors or employers. However, in recent years the issue of employee compensation has become more of an issue in Japan. A survey by the Nikkei Electronics Magazine in 1999 showed that among 1,777 electronics engineers in Japan, 32.2% felt that their companies did not provide sufficient compensation to their employees for patented inventions; 20.5% stated that their companies did not adequately support the patent filing process; 18% stated that it was unclear how their respective companies were calculating the profits associated with any particular patent; 2.7% indicated that cross-licensing unfairly detracts from the monetary value a company places on a cross-licensed patent; and 1.2% complained about other issues, the remaining 17.7% had no complaints.[12] These figures show that a majority of engineers in Japan are unhappy with the intellectual property policies of their company.

According to a MetLife survey, employees' satisfaction is also on the decline in the United States. On 2003 year, only 32% of the surveyed employees expressed satisfaction with their workplace benefits, 9% lower than the previous year. Job satisfaction has also decreased from 48% in 2002 to 44% in 2003. Interestingly, the survey showed a gap of more than ten percentage points between employer and employee views on workplace satisfaction. Whereas more than 41% employers believe that workers are satisfied, fewer than 32% of employees agree. [13]

In the United States, benefits, or rules for compensating employee-inventors, if any, are established by U.S. companies. U.S. employees are bound to these rules by their employment contracts. Therefore, as long as the employment contract is well executed

and the rules of the company are clear, neither statute nor case or patent law can affect the amount of compensation of U.S. employees for inventions created on the job. This is not the case in Japan.

While Japanese companies have internal rules to determine compensation to employees for their inventions, statutes play an important role in the determination of such compensations. In several cases, Japanese employees have resorted to taking their employers to court over the amount of compensation they believed they were entitled to for their employers' use of their inventions. In 3003, in the Olympus case, the Japan Supreme Court interpreted Article 35 of the law as permitting a judicial determination of fair compensation to an employed inventor. More recently, on January 28, 2004, the Tokyo High Court, in the Hitachi case, held that calculation of compensation is to be calculated based on both domestic Japanese patents and other foreign patents. The next day, a Tokyo District Court awarded an employee, Nakamura, inventor \$190,000,000.00 for an invention made ten years before the lawsuit was made. The award dictated by the court superseded the award stated in the employment contract by exactly \$189,999,800.00. [14]

This recent wave of court rulings has sparked a raging controversy in Japan's business world. Although executives are outraged by the large sums ruled by the court, the court rulings are welcomed by those who believe that they will motivate employees to focus on the creation of new products and technologies, thus, stimulating invention in the intra-firm setting.

Several other countries, such as Germany, Australia, and the UK, use similar reward systems to determine the reasonable monetary compensation to be awarded to an

employee for his/her creation. In Australia, for example, ADA section 7 of the law stipulates, as it is stipulated in U.S. patent law, that:

“However, where the design of an employee falls within the field of activity of the enterprise in which he is employed and if the activity that has led to the design forms part of the duties of the employee or if the design has been created on commission outside of an employment relationship, the right to the design protection shall, where not otherwise agreed, lie with the employer or the commissioner or his successor of title.” [15]

But unlike the United States employees inventors are “reasonably” compensated by the law. Calculation of this compensation takes into account the following aspects of the invention: (1) the economic importance of the invention to the enterprise; (2) any exploitation of the invention whether on Australia or abroad; (3) the portion of incentive, experiences, preliminary work or resources of the employer’s enterprise or internal instructions that have contributed to bringing about the invention. [15]

Two decades ago, the United States also considered “copying” the employee rights laws of Japan and Germany to promote innovation. Employed inventors laws were promoted by Congressman Moss, beginning in 1970. Bruce A. Lehman was spokesman of a Congressional attempt to pass legislation to introduce an employed inventors law patterned after Japan’s and Germany’s patent systems. The Moss Bill, modeled after West Germany’s employed inventors legislations, was the most ambitious legislative attempt of this sort. Representative Moss reintroduced the bill four times during the 1970s without success. In 1982, Representative Kastenmeier reintroduced the legislation.

The Kastenmeier legislative attempt also failed, despite the promise of promoting innovation, due to the relentless opposition of the corporate sector. This is the same reaction that we are seeing today from Japanese business and other International businesses situated in Japan. [14]

A study by Foley & Lardner suggests that this reaction can have a hampering effect on the innovation growth of Japan. International firms, particularly U.S. companies will be less likely to open a company in Japan, since they will presumably be operating under Japanese law. The study also suggests that the post-innovation determination of compensation does little for the promotion of innovation. The key to rewarding employees is to implement a significant employee reward program which guarantees specific rewards and thus provides concrete incentives prior to the innovation process, such as that stated in Australian law. As long as companies clearly state their measures for calculating a reasonable compensation for employee inventions, there should be no problem with post-innovation lawsuits.

Companies in the United State should consider implementing a similar employee reward program. Currently most companies offer certain types of benefits that improve employee satisfaction and productivity. But many of these compensation systems are dependent solely on the easiest metrics to measure personal performance. Profit sharing programs, for example, are an outstanding means of rewarding individuals for improving the company's standing. The down side is that everyone generally gets an equal proportion that doesn't recognize their individual contributions during a given year. A person who makes a revolutionary contribution will be rewarded the same as his co-worker who's performance was average or below average for that matter. This type of

reward, although prove to improve employee satisfaction of the average employee, provides no direct incentives to inventors.

Research has shown that employees want to stay actively involved with their innovations. It is important to reward innovators for their contributions, and to reward people who collaborate as well as individual performers. As mentioned earlier, we suggest an employee reward program where reasonable compensation is given to employees who demonstrate an ability to invent valuable technologies or products. This can be calculated as in the Australia example or can be calculated as a percentage of the royalties received by the company from exploitation of the employee's invention. In this way, the compensation received by the employee will always be directly proportional to the success of his/her invention. Similar compensations can also be given in the form of annual bonuses based on performance evaluations that emphasize innovation and collaboration. However the problem with this method is that it does not reward employees with inventions that are not marketable at the time of invention, but that show great potential for future innovation. But there are other types of incentives that can be utilized to reward innovators and collaborators, such as time off with pay, promotions and recognition programs. The problem with these incentives, however, is that they are not guaranteed since it is unlikely that a firm will incorporate them into their employment agreement such types of incentives and the magnitude of the compensation can be difficult to measure against an invention.

Finally, a good exit option can be also spur innovation far more than any post-innovation determination of rewards. An exit option gives employees the "possibility of exiting a firm with the germ of a particular invention." In the state of California

employees are given greater freedom to move to a competing employer. This is accomplished in the first instance by a liberal state law that permits an employee the freedom to a competitor. For the brilliant, this means that unless his employer treats him fairly and provides him both the creative and financial incentives to stay at his current place of employment, a direct competitor across the street is likely to lure him away with greater financial and creative incentives.

Thus, while there is no legal requirement for compensation beyond what is contractually stated in the employment agreement, if a great innovation is made that is indicative of future potential. Employers in California are likely to tear up the existing agreement and write a far more favorable one with incentives for future innovation, out of fear of losing the employee. According to Foley & Lardner, “there is a natural selection process in which those inventors who show promise for future innovation will be greatly rewarded. California does permit an employment agreement with a non-competition clause; but, the non-competition clause must be very narrowly crafted to be enforceable.”[14]

These considerations show that the best type of reward program is one that rewards both profitable inventions and inventions that show future potential. These kinds of reward systems can be promoted by state law. However, it is important to keep in mind that different reward systems may be necessary in different markets. For instance, a study on the pharmaceutical industry suggests that the current patent monopoly system is not satisfying the needs of the pharmaceuticals market. The current system leads to misdirected innovation, to substantial deadweight losses, and to counterfeit drugs, among other things. According to the study, an effective system of funding innovation in the

pharmaceutical industry should meet two fundamental requirements. First, rewards for innovation in pharmaceuticals should be proportional to the social value of the innovation. And second, prices should be near average production cost, in order to minimize deadweight losses and counterfeit drugs, and to eliminate the need for price controls. [16] Similar types of considerations should be taken with the software industry.

As stated in an FTC Issues report, patent law plays an important role in the property rights regime essential to a well-functioning economy.[17] The incorporation of incentive programs into patent policies are well worth consideration since they are in accordance with the primary purpose of the U.S. patent system, that is, to promote the development of the useful arts. As a result, firms become more innovative and therefore more competitive.

### **General Suggestions**

This section provides several suggestions that stem from the discussions above and from our findings. First, several suggestions will be provided for the improvement of tax policies. Second, suggestions will be provided for the improvement of patent policies that will enhance competition among firms and promote innovation. These recommendations will stem from our discussing and our findings.

### ***Tax policies***

Several studies indicate that tax incentives increase business investment and as corporate income increases companies are willing to invest more on research and development. Three proposed tax policies are faster capital recovery allowance, income

tax rate reduction and capital gains tax reduction. High inflation rates prevent companies from investing in long term projects, which are usually associated with the most significant innovation processes. Faster capital recovery for equipment would increase capital investment in this type of project. Modification to tax policies that would allow companies to depreciate capital equipment faster would increase capital recovery rate and reduce the cost of investment.

Another modification to tax policy would be to increase the profitability of R&D investment. Tax incentives and relieves should be given to companies who invest in new technologies. The incentives should allow companies to work on their own projects rather than impose a market or regulate the company's R&D. Tax deductions should also be offered to universities and independent inventors. Special attention should be given to increase the deductibility of capital losses for pioneer companies. This will be an incentive for investors to fund startups based on new technologies.

### ***Other suggestions***

Many studies indicate that the USPTO needs to improve in two main areas: quality and certainty. During past years individuals have been able to patent inventions that are not unobvious or new. An example is U.S. patent No. 6368227, which covers a "method for swinging on a swing." These types of questionable patents can increase costs to both consumers and innovators and, as a result, reduce innovation. Therefore, new legislative changes are necessary to implement a new standard of regulatory measures. These measures should ensure that only those inventions that are novel and non-obvious are patented. In addition, new measures should ensure efficient

administrative procedures. The current administrative procedures of the USPTO to handle challenges to the validity of a patent are time-consuming and expensive. Instead, new procedures should make it easier for innovators (individuals or firms) to challenge the validity of a patent should be implemented.

Until recently, patents were published when issued. Patent applications were not published. Although new patent applications are published, except those filed in the United States only, during the time the application remains unpublished firms sometimes invest substantially R&D to design and develop a product, only to later learn (when the application is published or the patent is issued) that this product is infringing a patent. This would cost them not only their R&D investment but a significant amount of royalty costs. This type of situations seriously disrupts business planning, and can reduce incentives to innovate, and, as a result, discourage innovation investments.

## **Conclusion**

Due to the complexities of patent policies and innovation in every field, each company and government agency must take into consideration their individual case and analyze their situation in order to obtain a method for promoting innovation in its field. There is usually a trade-off involved in each policy, and as studies show, this is usually between giving added incentive to employees and benefiting the government agency or company. In the case of government policies, awarding patent titles to inventors was found to increase their motivation to accept government contracts. On the other hand, when contractors have title rights there is a risk that they will not make the inventions available to the public which is represented by the government agencies. In the case of

private companies the tradeoff is between promoting innovation and increasing the firm's profit.

Companies should look into ways of creating a corporate culture that fosters innovation. They can do so by giving inventors reasonable compensations for their inventions and by providing other incentives that motivate employees to continue inventing. It is important, however, to consider the specific nature of the market of a given company in order to determine the best reward system.

It can be concluded that patent policies do affect the level of innovation as evidenced by the expressions of employees, contractors and university researched. When deciding what type of policy to implement, thus, the promotion of creativity should be of high priority. On the long run, the benefits of increased creativity will translate to increased production in both the public and private sector.

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