

From Project to Patent to Delivering an Invention

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Is getting a Patent a Project?

Often there are references to work efforts as projects that may or may not be considered projects in the traditional sense. Typically, projects have been defined as having objectives surrounding three parameters – technical performance, cost, and schedule – with a definite start and end time. Other definitions may describe the conversion of resources from one state to another, but there is still the schedule or time domain that suggests start and end target dates.

These traditional definitions of projects do not seem to apply when there is reliance on others to perform their part of the project and for which one has no control over the priority given that work or whether the result of that work will permit moving forward. Applying for and processing a patent for an invention is unique in that it may be planned like a project, but one person does not have control over all aspects of the work.

At some time many people have thought of getting a patent for a device that would bring fame and fortune. As the old saying goes “Build a better mousetrap and the world will beat a path to your door.” That old saying ranks right up on the top of the list of the biggest lies ever told. If you don’t have a patent, someone can take your invention. If you don’t have a plan to market your invention, no one will know that you have something better. To say the least, the patent process is not trivial and can be rather expensive from the start until the invention is sold in the market place.

The single greatest purpose of getting a patent for an invention is to make money. The time, effort, and money spent to obtain a patent should have a solid return. It may be a gamble to obtain and produce the invention, but there must be an expectation of a return on the investment.

Invention Development Life Cycle

The life cycle for developing an invention might be described as the following.

- **Idea Development** – taking a concept and putting it into a physical form that shows what the invention is intended to do. Can one describe the product and its functions?
- **Idea Assessment** – evaluating the concept to see whether it is a viable product and whether it serves a useful purpose that will sell. Is the product marketable to a given audience?
- **Patent Search** – a search of the existing patents in the Patent and Trademark Office of the United States. Does this product duplicate existing products that are patented?
- **Filing a Patent** – developing the documentation to support the claim that the invention has utility, is novel, and not an obvious design. Does the product do what is claimed here, is it unique in its operation, and more than an everyday operation?
- **Building Prototype Product** – construction of an operating product that performs the functions claimed in the patent documentation. This may not be an elegant product, but must contain the functions that make it unique.
- **Receive Approval of Patent** – obtaining the approval of the Patent and Trademark Office may require a few iterations that include providing more documentation on the design to providing evidence of the product functionality. PTO examiners require evidence be provided by the requester.
- **Manufacturing and Marketing Product** – production and selling the invention is designed to obtain a return on all the investments and time put into developing, patenting, and delivering a product.

The described life cycle is not a trivial task regardless of the simplicity of the invention. It takes time and money to obtain a patent. An idea is just that until it is reduced to a working product and delivered to the market place with the protection granted by a patent. Both simple and complex inventions follow a similar process, except the complex invention probably takes more resources to build a prototype and convince the Patent and Trademark Office examiners of the utility.

From an Idea to a Product

Perhaps the best explanation of the project approach to an invention is by way of example. In a recent discussion with Mr. Howard Harris, Tennessee's Inventor of the Year for 2007, he gave a description of the challenges to getting an invention patented and to market. Mr. Harris invented a water heater to replace the traditional unit.



Figure 1. Howard Harris, Tennessee Inventor of the Year 2006

The traditional model typically has two electrical heating elements in a steel casing that holds 30 to 50 gallons of water. The heating elements raise the temperature of the water from an ambient level of perhaps 50 degrees to approximately 150 degrees. The water temperature is regulated at this temperature of 80 to 100 degrees above the ambient level by thermostats. When water is taken from the water heater at the operating temperature (120-150 degrees), cold (approximately 50 degree) water replaces the volume drawn out. Depending upon the amount of water removed from the tank, the cooler water entering reduces the temperature resulting in electricity being consumed at a cost to raise and maintain the temperature of the water.

Mr. Harris used his knowledge in the homebuilding industry and knew this was an inefficient use of electrical energy to heat 30-50 gallons of water when typically only 10 percent of that amount is used at any time. Further, the addition of cold water to hot water reduced the temperature until electricity was consumed to raise the water back to the operating temperature again. Another inefficiency was noted in that the tank was made of steel and there was a loss of thermal energy through the tank walls. This traditional method of providing hot water for home use offered many opportunities for improvement.

Rather than improve the traditional water heater, Mr. Harris opted to design and build a new product and patent it. Some of the considerations in designing a new water heater were:

- Must serve the needs of a family currently using a 40-gallon tank.
- Must reduce the amount of thermal energy loss through walls of the heater.
- Must avoid mixing cold water into existing hot water to maintain an operating temperature.
- Must be more energy efficient than existing hot water heaters.

Final considerations resulted in the design of the Harris water heater to be an insulated plastic tub that has low thermal loss through the exterior walls. This tub holds 37 gallons of water that is heated by a single electrical element. Inside the tub is a copper coil that allows water to pass through and absorb the thermal energy from the tub of water.

A cut-away version of the Harris water heater clearly shows the insulation and the copper coil in the plastic tub is on the left while an operating version of the invention is shown on the right.



Figure 2. Harris Water Heater Cut-Away



Figure 3. Harris Water Heater

We Ask, So What?

Why is this invention better than the traditional method of heating water? Let's take a look at some of the features in Table 1.

Table 1. Comparison of Hot Water Heater Features.

Feature	Traditional Water Heater	Harris Water Heater
Product Cost	\$250*	\$300*
Operating Cost per Year	\$429	\$197
Maintenance	None	Fill reservoir with water
Repairs	Two heating elements to replace (must drain tank) at \$50. Change every 3 years. Two thermostats that may require replacement at \$50. Change every 5 years.	One heating element to replace (replace without draining tub) at \$25. Change every 3 years One thermostat that may require replacement at \$25. Change every 5 years.
Estimated Life	8-12 years	20 plus years*
Annual Life Cycle Cost**	\$502	\$235
*Estimates based on available data **Approximate yearly cost of ownership.		

It should be noted that the heating elements in the traditional water heater are exposed to fresh water that contains calcium and other contaminants that can adhere to the heating elements to reduce efficiency. Accumulation of minerals and rust in the bottom of the traditional unit can further reduce the efficiency over time. The Harris water heater does not suffer that type of degradation of efficiency because the fresh water passes through the copper coil.

How is developing an invention a Project?

In the example about the Harris water heater, Mr. Harris encountered numerous challenges that had not been anticipated. Detailed planning would have laid out the process, but frequent, emerging problems needed to be solved before moving on to the next task. An inventor has control over the technical aspects of a project, but the schedule and cost are driven by events that probably cannot be anticipated.

To illustrate some of the challenges of developing an invention, some of Mr. Harris's challenges are listed here.

- Initial submission of the patent application and responses to the PTO examiners. There were several iterations to submission of documentation to support claims. One could not anticipate and plan for all required additional information needed to support the patent claims.
- Because public safety is involved, product testing must be done by an independent agency – in this case, Underwriter's Laboratory. The comparison of the Harris water heater to the traditional water heater used safety and operating standards that did not appear to be appropriate.
- Department of Energy standards were applied for the efficiency in the traditional manner. The Harris water heater exceeded the requirements, but was first deemed to be less efficient. Bureaucrats had to be convinced that the application of traditional standards was wrong.
- Some safety needs were not initially anticipated and the heater had to be modified to meet valid requirements. This drove additional tests to validate the product changes.
- Filing a patent and testing an invention is not trivial, but requires financial considerations as to whether one can afford to develop an invention. In the case of the Harris water heater, the product testing alone exceeded \$50,000 – most of which could not be anticipated.

Developing an invention can use project management principles with the understanding that there will be interrupted workflow and emerging requirements will force changing the schedule and budget. Building from an idea to a working product, even for a simple product, can be time consuming and costly.

Applying project management principles can, however, make the process easier to anticipate tasks and meet the requirements.

A general schedule might have the following characteristics that would guide a person to smoother development of an invention.

- Use an automated scheduling tool to layout the process. The automated tool will make the change process easier and give a more accurate picture of progress.
- Plan in detail, but anticipate changes to the schedule, such as additional tasks and extended durations.
- Follow the general life cycle describe at the beginning of this article to phase the work.
 - **Phase I: Idea Development** – flesh-out and reduce the idea to a physical form such as a drawing or blueprint. Provide sufficient detail to show how the invention functions.
 - **Phase II: Idea Assessment** – determine whether the invention is a useful product for a given audience. Be specific about who would buy this product.
 - **Phase III: Patent Search** – conduct a patent search to determine whether there is a similar product that has been patented.
 - **Phase IV: Filing a Patent** – develop and file an application for a patent based on the fact that the invention is a product that can be marketed to a given audience and can be produced economically to compete with existing products.
 - **Phase V: Building a Prototype Product** – construct a functional prototype to demonstrate the viability of the product and to prove that it does operate. This may be needed to prove that the product does function as described in the patent.
 - **Phase VI: Receive Approved Patent** – this may be a milestone, but typically will require some iteration with the patent office. Patent approval is based on the unique and novel invention that has utility.
 - **Phase VII: Manufacturing and Marketing** – this phase is the proof of all other efforts in that the product must be manufactured and marketed. Manufacturing in volume may require special jigs and tools as well as unique materials. Marketing is placing the product before the audience to get them to buy it at the indicated price. Note that a marketing plan should have been developed early in the life cycle, perhaps during Phases I through V.

Implement the schedule with the expectation that there will be several changes in time durations and unexpected costs. One must be willing to work through the delays and additional costs to bring the invention to a product for sale.

In Summary

Applying for and obtaining a patent is not a trivial process and the use of project management techniques can aid in tracking the work, but not necessarily control the work done by others. These techniques, however, can assist in replanning as new work is identified and extend task durations when necessary to reposition work efforts for different time frames. A suggested life cycle places the work phases in the relative order in which they would be accomplished.

The Harris water heater is an excellent example of the end product of an invention. Seeing the need and bringing to bear the necessary effort and finances can bring results far beyond expectations. The many changes and unanticipated events can frustrate an inventor, but “One should enjoy the journey as well as

the destination.” Lessons learned from this example clearly demonstrate the instability of work efforts in applying for and receiving a patent, to include the unanticipated financial requirements for new testing and retesting.

The final phase of applying for a patent, Manufacturing and Marketing, is as important as all other phases. One must have a plan to efficiently construct a safe product that meets the demands of the market place because the primary purpose of getting a patent is to make money. A good marketing plan is needed to realize the benefits of being an inventor while using project management techniques to achieve success.

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