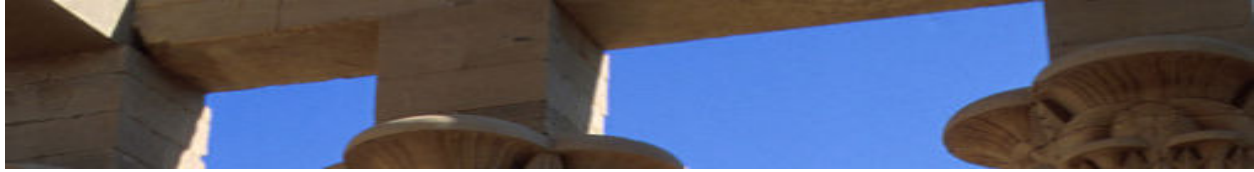


We turn good ideas into great products.



Porticool Patent Issued



We are proud to announce that the US Patent and Trademark Office recently issued Patent Number 7,527,612 describing a novel system for actively cooling the human body. A second patent is pending.

The Department of Homeland Security funded our early research and development in this field. Their goal was a device that would cool a worker who is “fully encapsulated” in a protective barrier garment. Such garments are

typically used to protect specialists from chemicals, biological agents, or radiation. Unfortunately, these garments also induce severe heat-stress in the wearer.

Porticos engineers conceived of a novel approach to active, self-contained cooling. Months of engineering and experimentation resulted in a prototype that is highly effective, lightweight, and completely portable. Furthermore, it does not require

modification of the protective garment!

Early success resulted in formation of Porticool, Inc., a company focusing exclusively on continued development and distribution of the Porticool Personal Cooling System. Porticool, Inc. is now working in partnership with Geomet Technologies to get this product into the marketplace.



RTP Deck Party

Porticos was a sponsor of the 2009 Annual RTP Deck Party. Porticos founders Sean Ahr, Kevin Carpenter, and Greg Patterson shared drinks, hors d'oeuvres, and conversation with representatives from many of the technology companies in the Raleigh-Durham area. We enjoyed seeing old friends and making some new ones.

Porticos presented our capabilities in R&D, Product Development, and Engineering Consultation.

Product Launch Announcement

Motorola has launched the MT2000, a next-generation mobile terminal. Porticos, Inc. provided extensive mechanical design and development expertise for this product. The Motorola MT2000 is a hybrid – a ruggedized scanner and a sophisticated mobile computer.

The 13-ounce unit features a rugged and ergonomic pistol-grip design, a 21-button keyboard and large color display. The terminal is designed for tough use in retail and industrial settings, and is rated for IP54 water resistance. The MT2000 is also designed to withstand severe drop, shock and tumble requirements as well as harsh environmental conditions. For this extensive design and development effort, Porticos' mechanical development team integrated with other disciplines from Motorola, collaborating to produce a game-changing product.



THE BUSINESS OF **IDEAS**

Greg Patterson, CTO

Part 11 in this 12-part series focusing on the development of ideas into viable products...

Successful ideas need to be backed up by the numbers. Everyone's idea is the greatest idea to them but if the return on investment doesn't offer an attractive return then it's probably not worth going forward. What is an attractive Return on Investment (ROI)? There isn't a firm number, it does depend on the circumstances but a good goal is 10:1. For every \$1 you invest you would want to get a return of \$10.

I find the best way to determine the ROI is by creating a spreadsheet that organizes all investments (expenses) and revenue. Once you have these two categories defined, the ROI is a simple calculation (revenue / investment). Unfortunately determining the investments and revenue are not as straight forward. There are inputs and assumptions you have to make. The goal is to make your inputs as accurate as possible. It is worth noting that regardless of whether you plan to license the technology or manufacture and sell the product yourself; you need to calculate the ROI from the perspective of manufacturing and selling the product. The reason is because you need some of those numbers to help determine the potential royalty and also because it will help you in your negotiations with the licensee. The more prepared you are the better your chances of interesting a buyer and inking a good deal.

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We begin by discussing the return on investment calculations from a manufacturing perspective, starting with the *EXPENSES*. The expense side of your spreadsheet will include a minimum of 3 areas for consideration; 1) material costs, 2) resource costs and 3) business related costs. Let's look at them each in detail:

Material Costs: This is the cost incurred in the manufacture of the product and can be broken down into several sub-categories.

Complete Parts List: Create a complete list of all parts that constitute the product. Everything from major components to the smallest parts like screws, tapes or labels. The accuracy of your parts list or Build of Materials (BOM) is dependent on how well your concept is defined. When in doubt, err to the conservative side.

Sales Volume Estimates: If you are developing an idea with an existing market, research annual sales volumes of similar products. These numbers can be ascertained from reading business and marketing publication in the field of interest. Now consider how much of that market you expect to capture. Start small. The fact is it will take time to wrestle much of the market from the current competition. You should not be surprised to only garner 5% in the first full year with growth to 20% in year 5. If your idea is in a new market area it will be more difficult to come up with a good estimate of sales volumes, but the same principles of research apply. You just need to realize that the resulting estimate will be less accurate and consider that accordingly when looking at the ROI.

Component Cost & Tooling Estimates: Component costs are a factor of manufacturing material (plastic, metal, wood, etc.) manufacturing processes (injection molding, progressive die, machined, etc.) and manufacturing volume. Typically the more you make of something the less each individual component will cost. This is the result of being able to spread setup and related tooling costs (fixed costs) over a larger number of parts; thus reducing the cost per part. If you work closely with the material and manufacturing processes needed to build your product, then you might be comfortable making cost estimates based on your experience. If not, don't be afraid to contact manufacturing sources and get preliminary quotes. Again, the accuracy of the quote will be subject to the completeness of the design, so keep that in mind.

Manufacturing Costs: Consider any assembly and sub-assembly costs. This will be related to the amount of time it takes to do the assembly and the hourly rate. If you've built a prototype then one way to estimate the assembly time is to just time the various assembly activities. With regards to the rate, consider if it will be made domestically or overseas and enter a value accordingly based on researching rates in those fields.

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Shipping and Handling Cost Estimates: Shipping costs will be a factor of manufacturing location, customer location, supply chain management, product size and weight. For small products like handheld type devices manufacture in Asia and sold in the US a good estimate is 15 to 20 cents per assembled unit.

Miscellaneous Cost Estimates: As you might expect from the long list of inputs, estimates and assumptions you have had to make in this section, the likelihood of being 100% accurate is slim to none. To compensate for unknowns, inaccuracies and miscellaneous costs it is worthwhile to sum the costs you have calculated previously and multiply by 20% to come up with an appropriate adder. This may sound like a lot, but more often than not you will find yourself easily using up this cushion.

You are now able to calculate all expenses associated with the manufacture of your product. Note that ROI goals are usually based over some period of time (typically 3-5 years) so to get the total investment for material, multiply the cost per part by the volumes expected over the period and add the fixed costs (like tooling, etc.). This will be your total investment in material over the period.

Resource Costs: This category takes into account the costs to design, develop and industrialize the concept. If you are in the business of product design, then you will be well positioned to estimate this cost. If not you will probably be faced with some combination of work you can do versus work you will end up outsourcing to a consultant or design firm. You need to estimate how much effort is required. As you might imagine, it is directly related to the complexity of the design and the manufacturing processes involved. As a rule of thumb, most products take between 6 and 18 months to design and bring into production. Design firms typically charge between \$100 and \$150 per engineering hour. The number of engineers range from 1 engineer for simple products to a team of ten, hundreds or thousands in the extreme cases like automotive or aircraft design. Assuming you aren't competing directly with Ford or Pratt & Whitney, you will most likely find yourself needing between 1 and 5 engineers. Doing the math this can range from \$100K to \$2M. You need to determine where in this range you expect to be.

Business Related Costs: These costs account for insurance, office space, utilities, marketing, etc. While you might be tempted to assume that these costs will be negligible, the fact is they can add up quickly. Product liability insurance can be very expensive, particularly if the failure mode (regardless of the cause) can result in bodily injury. For example, one simple product we developed and manufactured for the pet industry required \$10K annual liability insurance.

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Marketing is another area that can quickly add up. Recall from a previous chapter in this series that focused on marketing that advertisement in publications or other print, exhibiting at trade shows, radio or TV adds are all valid marketing options. You will most likely require some combination of these options, easily incurring \$20K to \$100K worth of expense for even a simple product in a short period of time.

Now let's consider the *REVENUE* side of the spreadsheet. The first step is to estimate how much the product will sell for. There are two approaches to coming up with this estimate and both are employed to gauge the accuracy of the estimate. The first approach is to calculate what the sale price will be "Bottoms Up"; meaning start with the manufacturing price and end with the retail price.

Distributor Pricing: Take the material cost (minus tooling costs) you developed earlier and multiply by 2. This will give you what the preferred distributor price would be. For example if you calculated the manufacturing cost at \$1, then you would sell to a distributor for \$2, netting you \$1. It's worth noting that this isn't necessarily \$1 in profit; it is simply a \$1 gain over the cost to manufacture the product. Out of this gain you need to pay for fixed costs (like tooling, etc.) resource costs and business costs. Remember my example for the pet product that required \$10K for liability insurance? We would have to sell over 10K units per year just to cover that one line item if our net return on sales is only \$1.

Wholesale Pricing: Take the distributor cost (\$2 in this example) and multiply by 2 again. This will give you the wholesale price (IE \$4 in this example). This is the price that a store would pay to buy the product and put on their shelves.

Retail Pricing: Multiply the wholesale price by 2 (IE \$8 in this example) to get the suggested retail price. This is the price that the end consumer would pay. Granted these factors are budgetary only. The product might sell direct (no distributor mark up) to a retail chain. Similarly the 2X factor can range to 1.3 or lower depending on the sell thru and other factors; but in general a 2X factor is a good starting point.

Will the market bear this \$8 cost? To answer this question we employ the "Top Down" approach by considering what the consumer might pay for the product. The easiest way to determine the product sale price from this perspective is to look at the actual retail prices for competitive products. People might be willing to pay more for higher quality or more innovative features, but probably less than you would like to imagine. You are going to need to stay competitive with your pricing to entice the buyer. Looking at our example, how does the \$8 product stack up with the competi-

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tion? Be honest in your assessment. If the “Top Down” and “Bottom Up” approaches are in close agreement, then you can feel more comfortable that your revenue projections are achievable. If you are not sure, you might want to invest in the aid of a marketing company to do some price elasticity studies, but bear in mind there is no guarantee of success.

Once the sale prices are estimated, you are now ready to calculate the overall revenue. Simply multiply the sales volumes (recall you estimated the volume of sales while developing your material cost estimates) over the 3-5 year period by the distributor sale price. If you want to be more accurate, consider what % you plan to sell to distributors, retail or direct and factor those additional revenues into your equation. Be careful not to use this practice to make a poor return marginal. You will only be fooling yourself. ROI can now be calculated. How does it compare to the 10:1 goal?

If your plan is to license the technology, you need to do a few more calculations to determine the return on investment from a licensing perspective. This is because the ROI you have just calculated assumes you will be manufacturing and selling the product but as a licensor of the technology you will most likely not be involved in all of those same practices. Starting with the investment side of the spreadsheet you would eliminate the material costs expense except for costs you do expect to incur such as prototype costs, etc. Evaluate resource and business expenses similarly by estimating how much of these two categories you will need. As a minimum you will need to devote some time and resources to developing the idea to the point that potential investors would be able to fully appreciate the concept. Similarly, marketing costs will probably diminish greatly since the company you are licensing the technology to would most likely already have advertisement and sales channels.

Next consider the revenue side of the spreadsheet. First and foremost, your revenue would be based on royalty from the sale of the product. Royalty agreements are varied and highly dependent on negotiations, market potential, etc. However a typical agreement would be based on some % of the revenue generated from the sale of the product. Basically we are talking about the distributor sale price time sales volume time some % for royalty. Assume a royalty percentage of 10% in your calculations. This will give you what your revenue from royalty will be. One thing worth noting is that it is not uncommon for the licensor to get some up money up front; basically a good faith payment to show the licensor that the licensee will have incentive to go forward with the technology and take it into production. My recommendation is that you not consider that in your revenue calculations. There reasoning is two fold. First, these up front payments are not guaranteed. Second, when they are given they are quite often considered advancements on the royalty. Effectively they are diluted when sales volumes start to reach the targets you’ve already accounted for in the royalty payments.

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You are now capable of calculating the ROI from the licensing perspective. How does this ROI look? One thing you should notice is that the ROI is substantially less than the ROI from a manufacturing and sales perspective. This is indicative of the risk versus rewards philosophy we discussed in previous chapters.

We've focused on a lot of numbers and assumptions in this chapter. Hopefully you haven't been scared off by the process or level of effort required. Don't overlook these important steps. While most inventors are more interested in the benefits to mankind that their technology affords, the fact is all businesses must generate revenue. At the risk of stating the obvious, the revenue must equal or preferably exceed expenses. Otherwise you won't be in business long. So take your time and do the proper research to make sure your idea will yield the ROI you need to justify the risk before you invest too much of your time and money.

To help you in your calculations we have created a [sample spreadsheet](#) built in MS Excel to guide you. Either click on the link in this newsletter or you can find it by clicking on the Product Development Engineering Tools icon in our website. Good luck!

WELCOME TO THE NEIGHBORHOOD

Porticos is excited to announce that Device Solutions Inc. will be moving in next door to us and leasing our office space.

Porticos and Device Solutions have worked together on many projects over the years and have developed a strong partnership that can provide mechanical, hardware and software support for customers seeking complete solutions.



Please join us in welcoming Device Solutions to the neighborhood.

COMMENTS?

Please feel free to direct any comments or questions about Porticos or our newsletter to Greg Patterson.

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