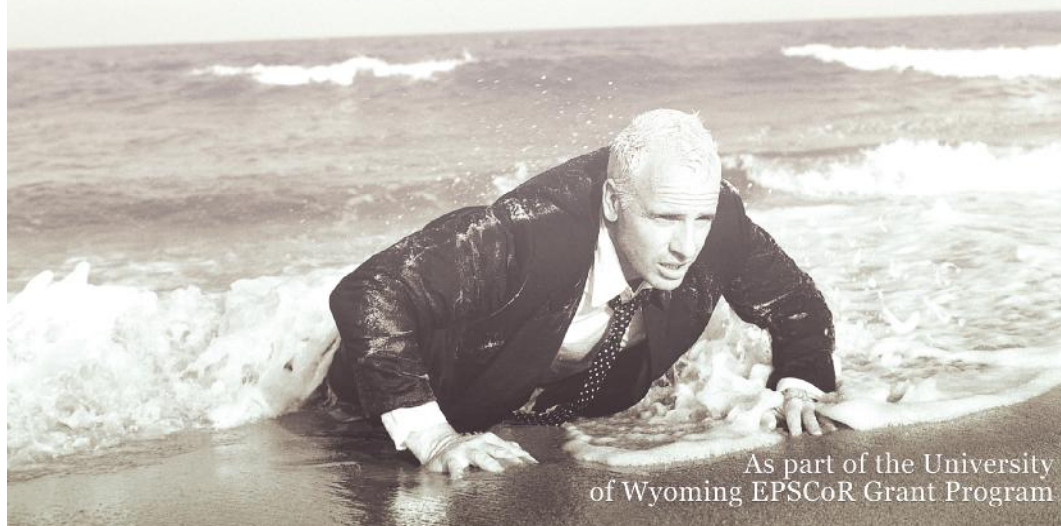


The How-To Guide for Light Industrial Microbusinesses

Startup Strategies, retrofitting
your facility, and the
dawn of the "Eco Shop"

Gretchen Heberling
with Dr. Anthony Denzer



As part of the University
of Wyoming EPSCoR Grant Program

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Table of Contents

Introduction	5
Starting Up.....	7
THE BUSINESSES: THE VOICES OF EXPERIENCE.....	8
THE ECONOMIC IMPACT OF SMALL BUSINESS	9
YOUR PRODUCT AND YOUR NICHE	10
INTELLECTUAL PROPERTY RIGHTS: PATENTS & TRADEMARKS	11
THE START-UP GAUNTLET: PAPERWORK, CODES, AND POLICIES	13
THE MONEY ISSUE: TAXES, EXPENSES, CAPITAL, AND LOANS	15
<i>Government Incentives & Tax Breaks.....</i>	<i>15</i>
<i>Expenses, Taxes and Deductions</i>	<i>17</i>
<i>Capital</i>	<i>22</i>
<i>The Loan Process: Q & A with Banks.....</i>	<i>23</i>
EQUIPMENT: BUYING VS. LEASING	26
INSURANCE: PROTECTING YOURSELF.....	27
ZONING	30
ONWARD AND UPWARD: WHEN TO FIND A NEW SPACE	32
EMPLOYEES: HEALTHCARE AND WORKER’S COMPENSATION.....	33
<i>The Hiring Conundrum.....</i>	<i>34</i>
YOUR RESOURCES: INCUBATORS & BUSINESS CENTERS.....	34
GETTING KNOWN: GARNERING AN INTERNET PRESENCE.....	36
KEEPING CUSTOMERS: THE IT INFRASTRUCTURE.....	38
<i>Customer Relationship Management.....</i>	<i>40</i>
<i>Order Management</i>	<i>42</i>
<i>Payment Services & Strategies.....</i>	<i>43</i>
<i>Customer Service</i>	<i>44</i>
SECURITY ISSUES AND SOLUTIONS	46
TIDES OF CHANGE: PROPOSED POLICY CHANGES.....	48

Retrofitting Your Facility 49

ENERGY CONSERVATION & BUILDING PERFORMANCE.....50

THE ECONOMICS OF ENERGY USE.....51

LEED, PASSIVHAUS, & LIVING BUILDINGS52

THE ENERGY USE PYRAMID56

The “EcoShop” 57

REVAMPING AN OLD SPACE: “ADAPTIVE REUSE”58

STARTING FROM SCRATCH59

DESIGN & LAYOUT OF THE SHOP.....60

MATERIALS ANALYSIS: THE EFFECT ON THE WORK ENVIRONMENT61

EMBODIED ENERGY: THE HIDDEN COST63

LOWERING ENERGY USAGE: INSULATION & INSOLATION64

EFFICIENT SYSTEMS & POWER GENERATION64

Air, Lighting, Windows, & Water65

HVAC SYSTEMS & AIR QUALITY69

ELECTRICITY: YOUR POWER & WIRING SOLUTIONS.....70

SAFETY PRACTICES71

STORAGE & DISPOSAL OF VOLATILE PRODUCTS72

SHIPPING: A ‘GREEN’ APPROACH.....72

RECYCLING & COMPOSTING.....74

Cost Analysis 77

CRUNCHING THE NUMBERS77

Works Cited 82

Acknowledgements 83

Introduction

This book is the culmination of a research project performed through a grant from the University of Wyoming's Experimental Program to Stimulate Competitive Research (EPSCoR) office. The concentration of this research is on microbusinesses in the light industry sector. For this research, to be considered a microbusiness, a company must have 20 employees or less, and/or have an annual income of less than \$500,000.

This book is meant to be the easy way for an entrepreneur to tackle the many challenges of starting a business. There are many things that lead someone to branch out on their own and become their own employer, but being an entrepreneur does not mean being an expert on everything.

Starting a business requires a lot of work, a lot of time, and many different types of paperwork. I have hopefully done most of the work for you; I have looked up the codes, researched the zoning policies, tax requirements, and state and federal stipulations, though this varies widely by location. I have interviewed small business owners from around the nation about their strategies, tips, and pitfalls. I have also included my personal experience in the small business world, and how I achieved success. Lastly, I will address the sort of policy changes I think should be implemented as a result of my interviews, personal experience, and research.

As an architectural engineer, I took an environmentally efficient approach to the retrofitting of the small business shop by proposing the concept of the "eco-shop". The idea can be applied not only to new construction, but also existing structures. It is easy, cost-efficient (something which is imperative for small business owners), and environmentally responsible. A cost-analysis of several key components of the eco-shop versus the traditional retrofit construction approach is examined, as well as the positive impact an eco-shop has on the surrounding environment, the employees working inside it, and the business environment itself.

My research was conducted in Laramie, Wyoming, a state with a fairly hands-off approach to small business regulation, taxation, and general government involvement. Most of the businesses I interviewed are from the local area, so their recommendations and prescriptions may differ from your personal experience because of their business climate here in Wyoming. For the portion of the book addressing sustainable construction for your microbusiness' shop, also keep in mind that the building ideas may be based off of the local climate as well.

Starting Up: Strategies and tips for the new entrepreneur

There are a lot of things to consider when starting a new small business. There's the unavoidable money you need to shell out to revamp your space, buy tools, hire employees, purchase shipping products, buy a domain name for a website, and so on. Perhaps you may even invest in a patent, which also has fees associated with it. Aside from the money, there's also a time investment; time needed to read up on zoning and tax laws, insurance programs and paperwork to be done.

This section serves to give the first-time entrepreneur a rundown of the things they need to consider, read up on, words they need to know, and laws they need to understand. Questions are also raised and answered; I have interviewed banks and businesses, as well as read many internet pages on the Small Business Administration's website, an indispensable source. The main difference between this section and a generic how-to guide you'd find at a bookstore is that through my extensive interviews and personal experience, I have addressed the problems associated with every step of the way and offered solutions based on the real-life experiences of other small manufacturing businesses. This research pertains mostly to light industrial manufacturing businesses, and many of the recommendations do not address retail or service businesses.

This section is not meant to be a prescriptive, rather a starting point in your small business knowledge. I hope it answers some questions and begins your journey as an educated entrepreneur.

The Businesses: The Voices of Experience

Throughout this book you will see callouts with quotes from the various small businesses I interviewed. Taking their advice into account is crucial for any new entrepreneur, because they have the experience of learning things the hard way. To protect their privacy, they will be referred to by pseudonyms.

Home Décor Business A: This small business based out of the Eastern Shore of Maryland has been active since 2003, with a few hiatuses in between then and now. The business primarily makes hardwood gates for home interiors, mostly used for keeping dogs and small children from portions of customer's houses. The owner currently works out of an outbuilding on her property which she has converted into an operable workshop, installing dust collection systems, work spaces, and storage for tools and packing supplies. She has no full-time employees, except for her husband. She builds five to eleven gates a week, and her annual sales are approaching six figures as of 2010.

Tech Business A: This small business is based in my college town of Laramie, Wyoming, with a new sales branch established in Lyon, France. The company has 15 employees, and started in 1986 after a university-funded project with IBM in 1983. They have recently moved from a house in northern Laramie to an old AT&T building converted into an office on one of the main streets of Laramie. A registered C corporation, this business has perfected a method to gathering and sorting industry specifications on plastics; their customers pay to have access to their database. With annual sales of over \$500,000 and over 350,000 users, this business grows rapidly, with around 350 new users per day.

Furniture Business A: This small business, based in Laramie as well, has 21 full-time employees. Run by a husband and wife, the company makes hand-crafted wood furniture, primarily sold to the hospitality industry for ski lodges, box stores like Cabela's, or for private customers' second home in the mountains. A registered S corporation, this business boasts annual sales of over \$500,000 as well.

Women's Business Center A: This non-profit works to bring economic justice to victims of domestic abuse in the state of Wyoming. Through this WBC, they also have an offshoot co-op program that helps women in the arts obtain loans, market themselves, and get gallery showings.

Bank A & B: Both banks that I interviewed are located in Laramie, Wyoming. I spoke to the general manager for both interviews.

Small Business Incubator A: Also based in Laramie, Wyoming, this incubator is centered around tech businesses in the area. Offering shared services like servers, printing, and marketing assistance, this intermediary serves to help businesses grow and generate jobs. They do not provide direct financial assistance, but rather serve as mentors.

The Economic Impact of Small Business

“The U.S. economy was built upon manufacturing. Now, after decades of outsourcing, most experts believe at least part of the answer for restoring the health of the U.S. economy is to get back to its manufacturing roots.”

-Business Week’s “Business Exchange”, 2010

Overall, U.S. industrial capacity declined by an estimated 1% in 2009, the largest year-to-year decrease on record, while goods-producing businesses shed more than 2.3 million jobs. While many sectors of the manufacturing industry are contracting, some sectors are expanding; for example, companies involved in the production of semiconductors are moving plants back into the U.S.

Many companies prefer to produce in the U.S., particularly if their manufacturing entails little human labor or is highly complex.

“This is a kind of manufacturing that will make sense to do in the U.S. for a long time to come,” said Tim Peddecord, chief executive of privately held memory-module producer Avant Technology, which recently opened a new 50,000-square-foot plant in Pflugerville, Texas. The new plant will boost the company's capacity to 800,000 modules a month from 500,000.” (Wall Street Journal)

The benefits to manufacturing in the U.S. are:

- Ability to turn around U.S. orders in 24 hours,
- Reduced freight costs, compared with shipping goods from China, can offset the added cost of U.S. labor,
- Proximity to major producers in one’s

Furniture Business A remarks:
“Because I market my product as ‘handcrafted in the U.S.’, my direct labor costs are the biggest business cost for me. But, I keep my labor in the U.S. because an American-based furniture business is unique these days and garners return customers.”

industry can prove to be an advantage.

- Better protection of intellectual property, as your product stays in the hands of employees you see day to day. Constant contact dissuades a thief from blatantly stealing an idea right from under your nose.

From a small business perspective, there can be disadvantages. **Federal regulations hit small businesses hard: businesses with 20 employees or less pay 60% or more per employee to comply than businesses with 500 employees or more, from a study in 2000.** Many of these businesses are home-based, businesses which I refer to as “microbusinesses”.

There are approximately 25.8 million businesses in the United States and over 99 percent of all employers are small businesses, according to the U.S. Small Business Administration. Microbusinesses make up for 53% of the small business sector, and small businesses produce over \$6 trillion per annum, according to a 1992 study. One would think with such a profitable sector of the market, the government would be kind rather than cruel to the start-up. Until recently, that was the case. With the economy in a recession, and the return of the manufacturing sector as a way to cure the slump, President Obama has taken some measures to implement easier and more egalitarian taxes and incentives, especially to the small business sector. I have outlined Obama’s plan for small business in the chapter titled “The Money Issue”. But, as of July 2010, small businesses are still wary to expand, particularly with the changes yet to come with the new healthcare bill.

Your Product and Your Niche

The key to having a successful small business get off the ground is differentiation: the ability to distinguish your product from your competitors. It could be that you have mastered a better technique for manufacturing your product, allowing you to market it at a lower price. It could be that you have an aesthetically pleasing product, allowing you to market it in the luxury sector. Perhaps you have a better website, better communication skills, or faster turnaround than your competitor. Without something that sets you apart, customers have no reason to buy from you versus the box-store, online, or closer to home.

A great way to discover your niche is to ask your customers. The benefits of your product are what caused them to purchase it from you, so ask for

feedback. That is also a good way to change the things that detract from your product as well.

Another tactic is to always keep an eye on your competitors. If they change their product lineup, analyze why they did it. Perhaps they found a better company to buy materials from, or tightened up their assembly process. The best thing to do is to always think like your competition: what would they do to improve on your ideas? How would they cut costs?

Intellectual Property Rights: Patents & Trademarks

Federal registration of intellectual property, including patents, trademarks, trade names, and copyrights, provide business owners with exclusive use of intellectual property in the U.S. as well as in a large number of foreign countries. Patents and trademarks also protect the owner of the rights from unapproved use by other individuals, allowing them to seek compensation, demand copycats to cease and desist, or pursue litigation.

The following are a variety of methods for protecting your ideas, products, and market share:

Trademark

Perhaps the most important step a new small business can make is acquiring a good company name, an attractive logo, and a memorable trade name. If people don't remember what your business is called, it's unlikely they'll be able to search it on the web or look it up in the phone book. If you want to prevent competitors from using your name or logo, a trademark is a good idea, wherever it is being used, eg. online, in print media, on signage, etc. To register for a trademark, you do not need a lawyer, and the application cost ranges from \$275-375 based on whether you submit an online or paper application. There are a few forms to fill out, and they are readily available online at <http://www.uspto.gov/teas>.

Copyright

After doing a quick and cheap registration through the Copyright Office (www.copyright.gov), you can start rolling out your business literature and start making a website. Copyrights can be very helpful for a microbusiness, preventing competitors from stealing your slogan, website design, or photos of products.

The life of a copyright can be variable: from 28 to 100 years after its creation, the life of the author plus 50 years, and so on. It can depend on when the work was published, whether it is a renewal, or how old the work is.

When you encounter people and businesses who steal and reuse your information, you can file a response to get them to stop using your materials through a Digital Millennium Copyright Act (DMCA) request for web sites, and by starting with a cease-and-desist letter for other matters, ideally issued through your lawyer.

A small business owner (SBO) must always pursue misuse of their intellectual property before filing an official complaint. SBOs that do not do so actually forfeit their rights to their own property and such intellectual property (IP) are considered abandoned.

Patent

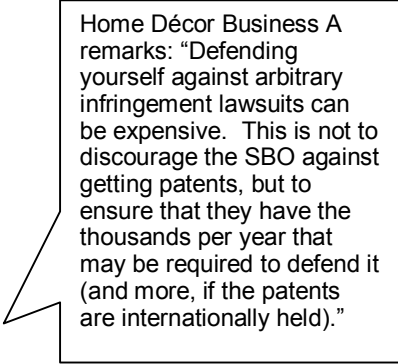
Tech Business A remarks: "We are constantly developing our programs, so we are making our previous programs obsolete all the time. That's why we don't pursue a patent."

Before filing for a patent, make sure you research whether the invention already exists and/or already has been patented. Patenting your product prevents competitors from making, using, or selling your invention, giving you time to recoup startup costs and develop working procedures for marketing and selling your product. A patent's protection only lasts 17 to 20 years, so to ensure you always have the exclusive rights to your product, keep your patent up to date and renew it when is necessary.

The best way for creators of a new idea (invention or business process or unique algorithm) to protect their ideas quickly and inexpensively is to file a provisional patent (which costs around \$110) directly with the U.S. Patent Office. This gives the SBO one full year before he/she needs to file a full patent (which costs around \$545) for the idea within the provisional patent. This is immensely helpful because the SBO can determine if the idea is viable, build a prototype, and/or determine if the money can be raised to pursue the idea. A patent attorney is not required when filing a patent, but they are very useful assets to have, as they are well-versed in reading patent applications and can help you ensure your application is complete. Further down the road,

Home Décor Business A remarks: "It is very important for the SBO to start the provisional or full patent process with novel ideas before first offering the idea for sale. If a competitor can validate that you were selling the idea prior to application of a patent, then the patent will be invalidated, no matter how novel."

maintenance costs for your patent will be required. At three, seven, and eleven years down the line, fees of \$490, \$1240, and \$2055 will be charged, respectively.



Home Décor Business A remarks: "Defending yourself against arbitrary infringement lawsuits can be expensive. This is not to discourage the SBO against getting patents, but to ensure that they have the thousands per year that may be required to defend it (and more, if the patents are internationally held)."

Pursuing patent infringement is a more complicated dealing. Patents may be filed in the USA and internationally. It is an arduous, and expensive process for anything other than the simplest of patents. Design patents are also easier to file and defend than complex scientific or technical patents. Patents are also subject to renewal fees, after they issue (called annuity payments).

Any other questions you may have on trademarks, copyrights, or patents can be answered by taking a look at the U.S. Patent and Trademark Office's website at www.uspto.gov.

The Start-up Gauntlet: Paperwork, Codes, and Policies

Before an entrepreneur should even start investing time and money into equipment, or purchasing, revamping, or renting a space, they should first take a look at the licenses and permits they need to fill out, as well as the codes and policies they must abide by.

Licenses and Permitting

Yet again, most of the information from this section has been parsed from the Small Business Administration's site, www.sba.gov and www.business.gov; if you need more detail, visit either, they are invaluable resources.

Since both the federal and state government are concerned with the quality of products being sold, the safety of the consumers, and the caliber of skill of the business owner, there are a few licenses and permits at both levels to ensure the safety of all involved.

On the state level, when a start-up is formed, it needs a business license, the main document required for tax purposes and conducting other basic business functions. Many states have established small business assistance agencies to help small businesses comply with state requirements.

For certain trades, the entrepreneur needs to go through a certification process in order to receive an occupation license. These licenses are required for occupations as varied as building contractors, physicians, appraisers, accountants, barbers, real estate agents, auctioneers, private investigators, private security guards, funeral directors, bill collectors, and cosmetologists. Since you can't always guess which occupations and professions are licensed by your state, you should always check with your state licensing authorities.

If you are selling a volatile or age-restricted product, some state licensing may be required. For example, most states require special licenses to sell liquor, lottery tickets, gasoline, or firearms. Contact your state licensing authorities to determine the licensing requirements of your business. Some tax registration may be required as well, depending on your state's tax policies. If the state in which you operate has a state income tax, you'll have to register and obtain a state tax ID from your state Department of Revenue or Treasury Department. If you're engaging in retail sales, you will need to obtain a sales tax license.

If your business will only be operated in your local community, registering your company name with the state may be sufficient, but in some cases you will need to fill out a trade name registration.

If you have any employees, you'll probably be required to make unemployment insurance contributions. For this reason, along with others involving healthcare and worker's compensation, you will need to fill out employee registrations. For more information, contact your state Department of Revenue or Department of Labor.

Some **federal requirements** include the aforementioned employer identification number (EIN); therefore, even if your state does not have an income tax, you will be required to apply for an EIN. Also, with the exception of sole proprietors, most business types must apply for an EIN regardless of whether they have employees. Visit the IRS site to find out if you need an EIN, and if so, whether you are eligible to apply through the IRS' online application.

Most businesses do not require a federal license or permit. However, if you are engaged in one of the following activities, you should contact the responsible federal agency to determine the requirements for doing business:

- Investment Advising
- Drug Manufacturing

- Preparation of Meat Products
- Broadcasting
- Ground Transportation
- Selling Alcohol, Tobacco, or Firearms

The Money Issue: Taxes, Capital, and Loans

In 2004, the paper titled “Home-Based Business and Government Regulation” highlighted the flaws of the system at the time:

- Tax code problems
 - the IRS penalized microbusinesses in their treatment of deductions, spreading depreciation over an unrealistic amount of time, penalizing businesses for returning home offices back to residential space, and making deductions unnecessarily difficult to report.
- The local level’s zoning laws provided a difficult barrier for microbusinesses, sometimes outright prohibiting home-based businesses or enforcing complex prescriptive requirements.

Government Incentives and Tax Breaks

On January 28th, 2010, President Obama proposed a tax cut for small business owners with three applications:

- 1) **Businesses will receive a \$5,000 tax credit for every net new employee that they employ in 2010.** The total amount of the credit for any one firm will be capped at \$500,000, to ensure that the majority of the benefit is targeted at small businesses. Start –ups will be eligible for half of the tax credit.
- 2) **Small businesses that increase wages or hours for their existing employees will be reimbursed for the Social Security payroll taxes they pay on real increases in their payrolls.** This bonus would be based on Social Security payrolls, so it would not apply to wage increases above the current taxable maximum of \$106,800.
- 3) **Firms will be able to claim the credit on a quarterly basis, which gets money out to businesses quickly and provides and early incentive to hire and increase payrolls.**

-www.whitehouse.gov

This is an example of one of many bipartisan efforts of the present government to address previous problems with the way the federal, state, and local levels handled small business.

The larger plans of the Obama administration are detailed in “Barack Obama and Joe Biden’s Plan for Small Business”, the points of which I will outline:

The current administration will help small businesses by cutting health care costs, improving access to capital and investing in innovation and development in these ways:

- Lower healthcare costs with a new small business health tax credit
 - Access to a low-cost national health exchange
 - Reduced volatility and lower costs by reimbursing catastrophic costs
 - Investment in cost reduction and quality improvement strategies
- **Zero capital gains and other tax relief for small businesses and startups**
- **Expand loan programs for small businesses**
 - The Small Business Lending Reauthorization and Improvements Act expands the Small Business Administration’s loan and micro-loan programs which provide startup and long-term financing that small firms cannot receive through normal channels. This will in turn help more entrepreneurs get loans, expand the network of lenders, and simplify the loan approval process.
- Invest in women-owned small businesses
- Increase minority access to capital
- **Support rural small businesses**
 - Provide training and technical assistance, as well as a 20% tax credit up to \$50,000 of investment in small owner-operated businesses

Expenses, Taxes and Deductions

No one wants to pay more taxes than they have to. Here are some terms that a small business owner should get to know.

Note: Much of the information in this section is parsed from the Small Business Administration's website. To view this information in more detail, visit www.business.gov or www.sba.gov.

Business expense: the cost of conducting a trade or business. These expenses are common costs of doing business, and are usually tax deductible if your business is for profit. For example, costs of renting a storefront, business travel, and paying employees are all deductible business expenses. These expenses are generally divided into operational or overhead expenses. The former are specifically tied to the creation of your product, while the latter are associated with getting and retaining business. Overhead includes advertising, marketing, accounting, and legal fees. Keeping overhead down while growing is a big advantage for small businesses.

Capital expense: the cost of purchasing specific assets, such as property or equipment, which usually have a life of a year or more, and increase the quality and quantity of products and services. For manufacturers, many states grant property tax exemptions on assets used in manufacturing. You can recover the money you spent on capital expenses through depreciation, amortization, or depletion. These recovery methods allow you to deduct part of your cost each year. In this way, you are able to recover your capital expenses over time.

Deductions: money that can be applied to reduce your taxes. To be deductible, a business expense must be both "ordinary" and "necessary." An ordinary expense is one that is common and accepted in your field of business. A necessary expense is one that is helpful and appropriate for your business.

Depreciation: if a piece of property is expected to last more than one year, the worth of the property must be deducted in part over the useful years of the property's life.

Amortization: deduction of certain types of property over a fixed period of time, rather than over the course of the property's life.

Depletion: deduction that allows an owner/operator to account for the reduction of a product's reserves, generally used for natural resources such as coal, oil, etc.

Business Taxes

The type of business you operate determines what taxes you must pay and how you pay them. The following are the four general types of business taxes.

- Income Tax
- Self-Employment Tax
- Employment Taxes
- Excise Tax

Income Tax: All businesses except partnerships must file an annual income tax return. Partnerships file an information return. The form you use depends on how your business is organized.

The federal income tax is a pay-as-you-go tax. You must pay the tax monthly or quarterly based on gross sales. How often you pay is based off of the size of your business' net income.

Estimated tax: Generally, you must pay taxes on income, including self-employment tax (discussed next), by making regular payments of estimated tax during the year.

Self-Employment Tax (SE tax): This tax is a social security and Medicare tax primarily for individuals who work for themselves. Your payments of SE tax contribute to your coverage under the social security system. Generally, you must pay SE tax and file Schedule SE (Form 1040) if your net earnings from self-employment were \$400 or more.

Note: There are special rules and exceptions for aliens, fishing crew members, notaries, state or local government employees, foreign government or international organization employees, etc.

Employment Taxes: When you have employees, you as the employer have certain employment tax responsibilities that you must pay and forms you must file. Employment taxes include the following:

- Social security and Medicare taxes
- Federal income tax withholding
- Federal unemployment (FUTA) tax

Personal Property Tax: This tax refers to the tangible goods retained by the company, including furniture, inventory, supplies and capital equipment (any physical item owned by the company). Every year, businesses declare these items, and months after filing, they will be billed a property tax at the state, county, and city level. Manufacturers often receive tax breaks in this department. This tax is the reason many manufacturers have year-end inventory clearances. Plan for this tax, especially if you have expensive equipment.

Excise Tax: if you do any of the following, you may have to pay excise taxes:

- Manufacture or sell certain products
- Operate certain kinds of businesses
- Use various kinds of equipment, facilities, or products
- Receive payment for certain services

This definition is so vague because there many excise taxes for many different kinds of products. For example, there is an excise tax on gasoline sales, as well as a “sin” excise tax on tobacco and alcohol. It would be impossible to give a general formula predicting which goods are subject to excise. Lists of such goods are readily provided by governments. Also, federal, state, and local governments can **all** charge excise taxes on one product, as is the case with cigarette pricing in some places.

Note: To be safe, every entrepreneur should look up the taxes for their state, as well as the product-specific excise taxes that can be incurred. Excise taxes also commonly have forms to be filled out in concurrence with payment, so be sure to find the corresponding form for any excise tax you have to pay.

Reporting Deductions for a Microbusiness

Deducting business expenses is pretty simple: it just requires splitting your expenses into personal vs. business. Personal expenses are generally not applicable for deductions, so any sort of family expense, like vacations, food, or home improvements to living areas should not be included. Business expenses can be split into these categories:

Home business expenses: If you use part of your home for business, you may be able to deduct expenses for the business use of your home. These expenses may include mortgage interest, insurance, utilities, repairs, and depreciation. The home office deduction is

available for homeowners and renters, and applies to all types of homes, from apartments to mobile homes. There are two basic requirements for your home to qualify as a deduction:

- 1) **Regular and Exclusive Use.** You must regularly use part of your home exclusively for conducting business. For example, if use an extra bedroom to run your online business, you can make home office deduction for the bedroom.
- 2) **Principal Place of Your Business.** You must show that you use your home as your principal place of business. If you conduct businesses at a location outside of your home, but also use your home substantially and regularly to conduct business, you may qualify for a home office deduction. You can deduct expenses for a separate free-standing structure, such as a studio, garage, or barn, if you use it exclusively and regularly for your business. The structure does not have to be your principal place of business or the only place where you meet patients, clients, or customers.

Generally, deductions for a home office are based on the percentage of your home devoted to business use. So, if you use a whole room or part of a room for conducting your business, you need to figure out the percentage of your home devoted to your business activities, and split the expenses likewise in order to make an appropriate deduction.

Travel, meals, entertainment, and gifts

Reporting these types of deductions just requires prudence: if you are traveling for business, report it; if not, then don't. Same goes for business meals, gifts for business associates, and so on.

For car use, you must divide personal and business use by actual mileage in order to write it off.

Other business expenses that can be written off can include:

- **Employees' Pay:** You can generally deduct the pay you give your employees for the services they perform for your business.
- **Interest:** Business interest expense is an amount charged for the use of money you borrowed for business activities.

- **Retirement Plans:** Money you set aside for you or your employees' retirement funds can be written off.
- **Rent Expense:** In general, you can deduct rent as an expense only if the rent is for property you use in your trade or business. If you have or will receive equity in or title to the property, the rent is not deductible.
- **Taxes:** You can deduct various federal, state, local, and foreign taxes directly attributable to your trade or business as business expenses.
- **Insurance:** Generally, you can deduct the ordinary and necessary cost of insurance as a business expense, if it is for your trade, business, or profession.
- **Business-Related Education:** For example, seminars, classes, educational tapes or CDs and conventions can be deducted.

Capital expenses: can be deducted by depreciation or by amortization, depending on which is applicable.

To depreciate a property, it must satisfy these requirements:

- It must be property you own.
- It must be used in business or held to produce income. You never can depreciate inventory because it is not held for use in your business.
- It must have a useful life that extends substantially beyond the year it is placed in service.
- It must have a determinable useful life, which means that it must be something that wears out, decays, gets used up, becomes obsolete, or loses its value from natural causes. You never can depreciate the cost of land because land does not wear out, become obsolete, or get used up.
- It must not be excepted property. This includes property placed in service and disposed of in the same year.

Note: Repairs cannot be depreciated unless they increase the value of the property, lengthen its life, or make it more useful.

To amortize a property, it must be a cost associated with:

- Starting a business, including the costs of researching a business idea and creating a legal entity
- Getting a lease on business property
- Intangible Assets including business licenses, permits, patents, trademarks, trade secrets, customer loyalty (goodwill); and the intangible value of physical items such as client lists and accounting and inventory records
- Oil and gas exploration
- Pollution control facilities
- Research and experimentation

Capital

The money required to start a business is not always easy to come by. The beauty of a microbusiness is that much of the capital needed is already invested in the property you currently own; a garage, unfinished basement, or an unused plot of land are embodied capital and can be converted into a shop easily and affordably. With many light manufacturing businesses, tools needed for the business may already be owned by the entrepreneur, previously used for home improvements.

“To determine your startup costs, you must identify all the expenses your business will incur during its startup phase. Some of these expenses will be one-time costs, such as the fee for incorporating your business and the price of a sign for your shop. Some expenses will be ongoing, such as the cost of utilities, inventory, insurance, etc.

While identifying these costs, decide whether they are essential or optional. A realistic startup budget should only include those elements that are necessary to start the business. These essential expenses can then be divided into two separate categories: fixed (overhead) expenses and variable (related to business sales) expenses. Fixed expenses will include figures like the monthly rent, utilities, and administrative and insurance costs. Variable expenses will include inventory, shipping and packaging costs, sales commissions, and other costs associated with the direct sale of a product or service.” (www.sba.gov)

Once a microbusiness becomes larger, more capital may be needed to expand into a new work space, invest in larger equipment, and hire more employees. Those sorts of expanding costs will be addressed in a later chapter.

The Loan Process: Q&A with Banks

I interviewed a couple banks regarding the small business loan process. For their privacy, I have used pseudonyms.

Q: An entrepreneur comes into a bank to apply for a loan for their small business. What are some things they would need to provide for you?

Bank A: It really depends on the amount of money they are asking for. Collateral is often required for large loans; for example, real estate

Home Décor Business A remarks: "I have used a portion of my home equity line of credit (HELOC) to fund capital equipment purchases when I absolutely had to, but the HELOC amount was very small relative to my home's value. Getting credit in today's markets is very difficult. If you do have regular in-coming accounts receivables, you may want to look into factoring to get money."

companies often use apartment buildings they currently own as collateral for purchasing new buildings. The main thing we would need to check is their personal credit history. For an "unsecured" loan, based just off of their signature, we are limited to give them only up to 15% of their annual income. Most of the businesses we finance are not startups, but rather businesses that are refinancing or purchasing more property.

Bank B: A new client to our bank asking for a business loan would require 3 years of financial records: personal tax returns, business tax returns (if their business has already been in operation for some years), as well as balance sheets and profit/loss records. For startups, we would need to see a 3-5 year business plan as well as a sales contract. At our bank we also give SBA loans for startups, which ask for lower down payments than our usual business loans.

Q: What types of businesses are you more likely to give loans to?

Bank A: It primarily depends on the borrower's history, not the type of business they are seeking to borrow money for.

Bank B: We have a 'watchlist' of more risky businesses that we evaluate more seriously before lending to, which includes all new startups, restaurants, non-owner-occupied real estate, and businesses in the lodging industry.

Q: Can you tell me about some of the government programs going on to currently encourage small business growth in the US that you participate in at this bank?

Bank A: Not that I know of.

Bank B: There has always been a push for females going into business. We are a big supporter of the Community Reinvestment Act which emphasizes minority lending. We have steered clear of public funding more recently so that we can keep funding available for these sorts of minority initiatives.

Q: Could you walk me through the process of getting a small business loan?

Bank A: Many small businesses that operate out of the home do well by applying for a home equity loan, which can then be applied to improvements on the home office, equipment, and so on. It is difficult for someone with no resources to begin with to successfully get a loan.

Bank B: I personally think that people do better to keep their personal lives separate from their business. By using a business loan rather than a HELOC, you are not putting your personal property up as collateral which puts your home life at risk if your business venture doesn't do so well.

Q: Do you think small business holds the key to the revival of our economy?

Bank B: No, I think we haven't seen enough effect on consumer borrowing yet, and I think until we see that turn around, we won't have a turnaround. I think we have about 24 months left of this recession, at least.

The next questions pertain to the business environment in my town, Laramie, Wyoming, home of my college, the University of Wyoming.

Q: Tell me about Laramie's small business community. Are our businesses financially successful? How many of them have you financed in the past? What helped them achieve success?

Bank A: I can't really guess how many of them we have financed, but I can tell you that rental properties are a good business to be in here in Laramie. Many people buy up old houses and retrofit them for apartment spaces for students. There are quite a few successful car repair businesses, as well as home furnace manufacturers.

Bank B: Albany County is the 15th least economically stressed county in the U.S., according to Laramie's Economic Development Corporation. The times we see small businesses struggle most here is when a big corporation comes into town.

Q: How is Laramie a good/bad small business environment? Is it in any way incubated by the small-town atmosphere? Or is it more susceptible to failure due to the size of the town?

Bank A: There are a few industries that are very good to be in here in Laramie: the energy industry, for example, as well as the tech industry. The University keeps the economy moving; a town like Rock Springs has more pronounced booms and busts, while the constant job market due to UW keeps the business environment less volatile. UW also introduced Wyoming's first small business incubator, the Wyoming Technology Business Center, which has helped many small businesses get their foot in the door.

Bank B: By banding together, many small businesses in Laramie help to insulate themselves. The Downtown Laramie Business Association is an example of how those businesses keep themselves supported by joining together.

Q: Do you have any words of wisdom for new entrepreneurs?

Bank A: Well, a friend of mine's father had a business in Fort Collins, Colorado that he started in his garage, making Styrofoam molds for packaging. He had an idea that was not unique; anyone can buy the Styrofoam beads and heat them up in a hopper to mold them, but he had some knowledge that gave him an edge: he knew how to use a milling machine to make the aluminum molds for the beads, allowing him to quickly make new molds when companies gave him new orders. He eventually got some great contracts from HP and Waterpik. The problem is, he got greedy. He started asking for 30% more than his original fees for the molds, so Waterpik just bought their own milling machines.

My advice is this: when you have an idea, make sure that you have some key knowledge that sets you apart. Once you have a customer base, make sure to maintain and cultivate them rather than taking them for granted.

Bank B: For startups, I would just recommend doing a lot of research, staying conservative, and make sure you have at least 6 months of working capital before you even think about going into a new venture. New businesses take at least 3 years to show a profit, so really consider the risk.

For existing businesses, I would encourage them to make smart changes now, especially while sectors like retail are seeing 50% drops in sales. Reconsider your overhead, your business strategies, and your inventory control. Think about downsizing, maybe getting rid of some unnecessary equipment.

Equipment: Buying vs. Leasing

The beauty of a microbusiness is that much of the equipment you might need, you probably already have.

For the other equipment you need, the question you need to ask yourself is whether to lease or buy. Equipment you only foresee yourself using once to a few times should probably be leased: for example, any equipment you will only use for making the initial retrofits to your shop. Items like hand tools are a pretty obvious example of something you should buy, as they are relatively inexpensive compared to items like computerized numerical controlled (CNC) equipment or conveyors. Some equipment cannot be leased, such as paints, solvents, cleaning supplies, safety equipment and so on, and therefore should be calculated into your startup costs. Sometimes, either leasing or buying can be a tax advantage. In some cases, leasing is considered a 'purchase' by the IRS, and so it might be better to just buy the equipment.

Home Décor Business A remarks: "When I started up my business, I already owned my circular saw, dust collector, brushes, shelving, sawhorses, etc. from my home improvement projects over the years. I also already had a computer to use for customer data and payment systems. This offset a lot of initial equipment costs."

A big investment for light industrial microbusinesses might be a larger vehicle, such as a truck or van for carrying packaged products to shipping facilities or vendors. For some, this won't be an issue, as they already own a large vehicle. For others, it's a large investment that might need consideration.

Insurance: Protecting Yourself

Note: Again, the following section contains information parsed from the Small Business Administration's website, www.sba.gov.

Buying business insurance is among the best ways to prepare for the unexpected. Without proper protection, misfortunes such as the death of a partner or key employee, embezzlement, a lawsuit, or a natural disaster could spell the end of a thriving operation. Often more of a necessity than a recommendation, there are many ways to protect yourself and your company. Insurance is available for nearly any business risk. Considering the multitude of available options, business owners must carefully weigh whether the cost of certain premiums will justify the coverage for a given risk based upon probability and cost. The best strategy is to find an honest and reliable broker to help find the policies that best fit your needs.

General Liability

Many business owners buy general liability or “umbrella” liability insurance to cover legal hassles due to claims of negligence. This general business protection policy, often called a “BAPP” policy, helps protect against payments as the result of bodily injury or property damage, theft, damage to facilities, medical expenses, the cost of defending lawsuits, and settlement bonds or judgments required during an appeal procedure. The BAPP or general liability policy should be augmented to include product liability protection for any products that you sell.

Product Liability

Every product is capable of personal injury or property damage. Companies that manufacture, wholesale, distribute, and retail a product may be liable for its safety. Additionally, every service rendered may be capable of personal injury or property damage. Businesses are considered liable for negligence, breach of an express or implied warranty, defective products, and defective warnings or instructions. This type of insurance is practically indispensable for microbusinesses in the light manufacturing sector.

Home-Based Business Insurance

Contrary to popular belief, homeowners' insurance policies **do not** generally cover home-based business losses. Commonly needed insurance areas for home-based businesses include business property, professional liability, personal and advertising injury, loss of business data, crime and

theft, and disability. For a small business with a home office or shop, it is wise to consider this type of insurance, especially if there are volatile or dangerous solvents, and tools being employed. If customers are going to be visiting your home's property, you should also consider having homeowner's and personal umbrella coverage.

Internet Business Insurance

Web-based businesses may wish to look into specialized insurance that covers liability for damage done by hackers and viruses. In addition, e-insurance often covers specialized online activities, including lawsuits resulting from meta tag abuse, banner advertising, or electronic copyright infringement. This sort of insurance can protect a growing microbusiness from being blindsided by theft by a competitor of website designs, product ideas, and so on. As of 2010, most small businesses have found the premiums too high and the loopholes in coverage too broad for this type of insurance.

Worker's Compensation

Required in every state except Texas, worker's compensation insurance pays for employees' medical expenses and missed wages if injured while working. The amount of insurance employers must carry, rate of payment, and what types of employees must be carried varies depending on the state. In most cases, business owners, independent contractors, domestic employees in private homes, farm workers, and unpaid volunteers are exempt. Worker's compensation will be addressed in more detail in the section on employees.

Home Décor Business A remarks: "Workers compensation insurance was much too expensive for me. It was important for me to get a good agent for product liability insurance, but worker's comp was a bear."

Criminal Insurance

No matter how tight security is in your workplace, theft and malicious damage are always possibilities. In fact, most theft that occurs in a business is at the hands of its employees. If you have a point of sale (POS) system in your shop, theft is probable. Criminal insurance and employee bonds can provide protection against losses in most criminal areas, but the best policy is due diligence and good personal practices, such as monitoring your employees with CCTV systems and taking care to get rid of bad eggs when you can.

Business Interruption Insurance

Some businesses may wish to acquire insurance that covers losses during natural disasters, fires, and other catastrophes that may cause the operation to shut down for a significant amount of time. Shops or warehouses in hurricane or flood-prone areas may be wise to consider this type of insurance.

Key Person Insurance (aka Continuity or Officer Insurance)

In addition to a business continuation plan that outlines how the company will maintain operations if a key person dies, falls ill, or leaves, some companies may wish to buy key person insurance. This type of coverage is usually life insurance that names the corporation as a beneficiary if an essential person dies or becomes disabled.

Malpractice Insurance

Some licensed professionals need protection against payments as the result of bodily injury or property damage, medical expenses, the cost of defending lawsuits, investigations and settlements, and bonds or judgments required during an appeal procedure.

Understanding Your Liability

After talking to several small businesses, the following are a few recommendations that I have garnered from their experience:

The greatest liability experienced by most small business owners is the risk to their personal assets. Many small businesses are formed as sole proprietorships, which are the easiest to form, involving a simple registration process with the state in which you operate, and a filing of a Schedule C on your Federal taxes. However, the owners' personal assets are at risk with a sole proprietorship. Should an SBO be sued, they could lose personal assets as a result. Lawsuits don't have to be serious to imperil your assets. Many a business has been hurt or put out of business by frivolous lawsuits.

A microbusiness should try to form a Limited Liability corporation (LLC) or S-corporation in order to reduce risk on owners. Once done, the business should keep all transactions with owners at "arm's length". This is a phrase which essentially means that the transactions of the owner and business should be cleanly separated. The owner should not be drawing out funds, nor depositing funds, into the business without clear documentation in the accounting systems. Ideally, this would be highly restricted to injections of capital (increasing the owner's basis or share

amount), return of capital, officer's salary, or repayment of a loan to the owners (with market rate interest).

It is recommended that business owners also have a personal umbrella policy in addition to protection on their home and cars. These policies "kick in" when unplanned events, such as someone falling on your property or getting bit by your dog, occur.

All businesses, once they are on their feet, should have a general liability insurance policy. This will protect your business assets, including property, tools, and recovery from fire, wind damage, theft, vandalism, and so forth.

Businesses with property in disaster-prone areas should have flood and/or fire insurance, which is available from the Federal government and sold through insurance agents.

Lastly, if the microbusiness sells products which might injure someone (such as solvents, or baby gates for example), the general liability insurance policy should be augmented with product liability protection. This can be difficult to acquire, and involves much more paperwork, but is essential if your product can loss of life or physical disability.

Zoning

Ordinances and Regulations

Zoning ordinances and regulations are laws that define and restrict how you can use your property. When planning to convert a space in your home into a microbusiness, it is a good idea to consult the zoning laws in your town, county, and/or state in order to make sure that any changes you make will be allowable. You may encounter restrictions that forbid your business from growing too large, from housing certain types of facilities, or from conducting certain types of manufacturing or sales. These problems can be addressed by working with a land use attorney or by speaking with the local planning department.

Home Décor Business A remarks: "It is critical that your business not consume street parking, and that your business waste be handled by a commercial waste service, so you are not consuming public services intended for homeowners only."

One zoning use is typically not compatible with another. For example, a commercial building usually cannot be constructed on property that is zoned for residential use. Therefore, a microbusiness cannot put up a

storefront in their house if it is in a residential neighborhood, but a small workshop or studio is typically in line with zoning laws.

Getting the zoning changed on a property is a very difficult process. It requires a process of giving public notice and then having a variance approved by government agencies that oversee enforcement of the zoning plan. Opposition to zoning changes by neighbors and other interested parties can be fierce. If your business has expanded to the point that it is breaking zoning laws or your neighborhood is very averse to a light manufacturing business, it might be a better choice to just purchase land off-site to build on, join a co-op for similar businesses, or outsource your manufacturing process. The question of when to “graduate” to a larger space, such as a warehouse, is addressed next, in the chapter titled “Onward and Upward: When to Find a New Space”.

Typical zoning categories include:

- Residential
- Commercial
- Industrial
- Agricultural
- Recreational

The ones of interest to the microbusiness are Residential and Industrial. Residential zoning is split into parts for single-family dwellings and multi-family buildings. Zoning laws on home-based businesses can depend on the nature of the business, whether there are employees or business invitees, the hours of operation, signage, parking and delivery concerns, and noise issues. Some zoning ordinances prohibit all in-home businesses in residential areas. Others restrict the type of business and business hours, and may require separate parking and entrance facilities. Rules regarding home-based businesses for condominiums are typically even more restrictive than private residences (www.realestate.findlaw.com). If your building is in an industrial zone, then there may be noise limits, setback requirements, height limits, and area stipulations for the building.

Exceptions: Non-Conforming Use, Conditional Use, & Variances

Existing properties are often used in a manner that’s inconsistent with a new zoning ordinance, but are allowed through “grandfathering”. These properties are generally unaffected by new zoning laws, and are rendered exempt under non-conforming use.

A conditional use is a use which is permitted under a zoning ordinance, but which must meet certain conditions. For example, a zoning ordinance may permit professional offices in a residential zone if at least four off-street parking places are provided.

A variance or special use permit is an exception to the requirements of a zoning ordinance. Most statutes permitting the adoption of zoning ordinances also detail the circumstances under which variances may be granted.

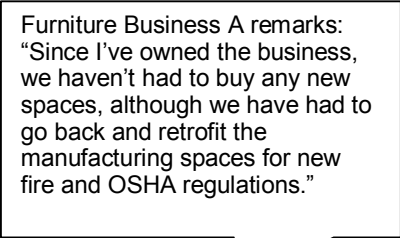
Again, the best way to deal with zoning issues you encounter is to speak to your local planning department.

Onward and Upward: When to Find a New Space

When considering ‘graduating’ to a new space, there are a few questions to be answered:

1. Is the space getting to be too small? Are you running out of room for tool storage, packaging supplies, or employee workspace? Or are you beginning to violate zoning laws, such as noise pollution?
2. Are you in need of a new employee, but don’t have enough space for them to work in?
3. Do you have money saved up for rent for a new facility? Or would you rather purchase space, such as a warehouse?

If many of your answers to these questions are yes, then you probably need to consider upgrading or expanding your current space, or moving offsite to a new space. The next thing to consider would be:



Furniture Business A remarks: “Since I’ve owned the business, we haven’t had to buy any new spaces, although we have had to go back and retrofit the manufacturing spaces for new fire and OSHA regulations.”

4. Would you be moving completely out of your current shop or would you just move some of the operations, like assembly, packaging, or shipping to the new space?

It may be more financially responsible to gradually move operations from one spot to another through renting a small space for shipping, or by

participating in a co-op for similar businesses. Often, co-ops provide studio space for rent and pool funding for tools and storage space.

If you are easily capable of serving your current customer base, your employees have adequate space to conduct their duties, and your space is still compliant with zoning laws, there is probably no reason to look for a new space.

Employees: Healthcare and Worker's Compensation

Whether your business is going to provide healthcare to its employees is another thing to consider. Microbusinesses are not required by law to provide healthcare for their employees unless they grow to a staff of over 50, but many employees want a job that ensures a healthcare plan; so to secure a staff of skilled workers, it might be a good idea to institute a business healthcare plan. Healthcare costs can range from \$250 to \$500 per month for individual policy coverage. Costs can go higher if the rates on the company are adversely affected by their risk pool, which varies by state. For example, in DC, where my small business was founded, risk pools are formed by companies of similar size. Then age tiers are used within the pool to determine one's rate.

Through Obama's new healthcare plan, states will implement healthcare "exchanges", which will offer easy competitive benefits at affordable prices. These changes won't be finalized until 2014, so for a microbusiness starting up now, it would be a good idea to investigate health insurance for your staff through the current providers.

Home Décor Business A remarks: "In DC, the annual charge was about 4% of my revenues because employees were performing risky tasks such as working on stepladders or scaffolding or using chemicals in the workshop."

Worker's compensation is a troublesome investment for small businesses when they are just getting off of their feet, but one that has to be done, in differing ways based on what state your business is in. Your employees need protection, and if they get injured on the job and your business has been negligent in worker's comp payments, there may be exorbitant fines, along with the employee's medical bills.

Worker's comp costs are not based on the number of employees, but on total payroll and the nature of the business. If a worker is performing relatively low-risk tasks, such as using hand-held tools, the rates are lower at around 1-2%.

Worker's comp is mandated by every state in the U.S., except Texas, and covers most accidental injuries incurred on the job except for things like heart attacks, injuries due to horseplay or intoxication, and so on. As mentioned in the insurance section, a SBO should purchase worker's comp through an insurance agency.

The Hiring Conundrum

Due to these high monthly costs, many businesses opt to stay small, hiring few employees or none at all, keeping the business "in the family", perhaps only hiring relatives. Sometimes, hiring employees becomes imperative, for running a business requires a slew of skills that the SBO may not have, and therefore many peripheral jobs such as graphic designer, janitor, IT professional, and others begin to require skilled workers to fill them. The SBO has to make this choice; either:

- **Learn to wear many hats.** An SBO can educate themselves on a subject, therefore alleviating the need for an employee. Many SBOs do this to keep their business small and cheap to run. This type of business may also hire contractors for short periods of time, rather than invest in hiring a full-time employee.
- **Hire employees, but train them for many skill sets.** In this economy, an employee will be thrilled to have a job, so take advantage of this and educate them in many areas. Having a well-rounded employee not only helps you financially, but also enables them to perform well in your business as well as any business that they may work for in the future.

The most cost effective practice is to outsource specialized tasks to a subcontractor. It is not difficult to acquire short-term contracts with accountants, web developers, and graphic designers, to name a few. Many work per task or bill by the hour.

Your Resources: Incubators & Business Centers

With the Obama administration's bigger emphasis on small business growth, the new SBO has a wider array of resources at their command than before. Non-profit business centers can help with education on marketing yourself, help with obtaining loans, and offer free services to help you get your ideas off of the ground. Small business incubators are also popping up all over the country, enabling entrepreneurs with little capital or workspace to jumpstart their businesses. Many offer studio space, money counseling, and other helpful services. These places are

often a good start for a novice entrepreneur and can effectively help with self-education.

I spoke with a non-profit business center, an economic development corporation and a technology business incubator, all located in Laramie.

The main problem I see with these incubators is that they are not direct. The entrepreneur in this cutthroat economy needs to be as quick and effective as they can be in their first months, and intermediaries can sometimes hinder more than help. The entrepreneur would be better served through direct acquisition of seed capital and clear-cut assistance rather than the longer 'mentoring' process often associated with these incubators, venture capital funds, and non-profit business centers.

That said, there should be a differentiation between assistance given to **practices** versus **growth-motivated businesses**. I see a stark difference between the two, and believe that government programs should follow suit in their methods for assisting them.

With a practice, the company starts small and stays small, confident in the expertise of its founder(s). Many of the SBOs are happy to stay small and may not even hire employees; they are content to build a supportive customer base and make a comfortable salary. Some deliberately choose not to hire employees due to high worker's comp and healthcare costs. These SBOs are also usually skilled in many areas beyond their product development, employing the strategy of wearing many hats combined with smart use of subcontractors (addressed in the previous section). Able to design their own websites, market themselves effectively, and learn the ropes of their business by themselves, they require little mentoring, or feel that they do not need it. Assistance for these companies should be direct, for an intermediary like an incubator serves little purpose to these driven individuals. Grants for product development and protection of intellectual property serve these businesses well.

Growth-motivated businesses, on the other hand, are a different case, and should be treated as such. These SBOs may have a great idea for a product, but might not have the facilities to produce it in. Perhaps they have a narrow but expert skill set, and need help educating themselves about company organization, hiring new employees, or marketing. One thing that these businesses are intent on is growth. They want to grow, but they need a new skill set, key pieces of business education, or just a mentor to be there when they have questions. Assistance to these sort of businesses can be very effective if in the form of an intermediary, for

incubators and non-profits can serve as a support network, a way to make connections in the business sector, and an opportunity to make use of shared services that the business might not be able to afford otherwise. Grants for job generation and self-education would be appropriate for these businesses.

With the distinction made between practices and growth-motivated businesses, I believe the government could serve the new entrepreneur better. Giving all the money to intermediaries isn't a solution, and neither is giving all the money to the new SBOs. A mix of both would be the best idea, and not too complicated to implement.

Getting Known: Garnering an Internet Presence

The first step to getting known is a good domain name. Registering your domain name with a service like www.godaddy.com as soon as you can is a surefire way to get ahead of the game and prevent competitors from pulling the carpet out from under you. Sometimes competing companies will try and purchase their competitor's domains when they come up for renewal, so try and keep tabs on your owned domains. Some tips for deciding on a domain: keep it short and simple. A website that is longer than ten characters can start to become too long and is not easy to memorize. You want a catchy, memorable name that will stick in your customer's minds, one containing keywords that people will hopefully be searching for.

The next step is designing an easy-to-use, attractive and informative website. Your home page should clearly state the name of your company, what you make and sell, and how to buy it. If a customer is greeted with

Tech Business A remarks: "We initially used Google ads, but eventually we discovered that by putting our information out there for Google to find, our customers were organically searching for us by searching for the data keywords. I believe the customer's attention is not on the right side of the page, at the ads anymore."

cheesy animations, grainy photos, and no real way to understand how to purchase your product, you won't have many customers. It might be helpful to get some knowledge about scripts (e.g. Java, HTML, etc.) for writing websites, if you want to design it yourself. Designing your website yourself provides you with unlimited freedom; you can choose how you want to display your product, add videos, design your own customer input forms, and

create personalized order responses synced with your email account. If you don't think that is for you, there are companies that provide e-store templates, or online store communities, like Yahoo! Store. Hiring your own

graphic designer to help make the site flashy, aesthetically pleasing, or eye-catching may also be an investment you are willing to make. This is not required, but may help set you apart from your less technologically savvy competitors. The biggest thing to remember is that there should be as few clicks as possible between your potential customer and the product itself. It is also very important that your website be search engine optimized (SEO). A website is useless if Google doesn't find it easily, so educate yourself; there are many books on the subject.

Once you have a registered domain name and an attractive website, the quest for Google superiority is one that requires a little finesse. It's not as easy as buying ads for the terms that describe your product; your competitors can just as easily do that, and they might have gotten to the most popular ones before you started your business.

The process is quite involved: you bid on search terms, and compete against other vendors. You then use statistical tools to determine which search terms result in the most conversions of clicks to sales. Then, you'll bid those search terms up to a rate that you can afford. All vendors set a daily budget. An average SBO running a home-based business will spend about \$225 a month if they get good amounts of organic search traffic (people searching for their product without a need for ads). New vendors or vendors in a competitive market space often spend \$1000 or more per month.

Home Décor Business A remarks: "The art of web site analytics is a long hard slog. The folks who are best at it have an understanding of statistics, and familiarity in the design of experiments. In fact, many of us run A/B tests to determine what effect various advertising and web site layout changes have on conversion. This is a big part of doing business if you have Internet presence. I highly recommend taking a statistics course."

There are other methods to attracting customers and getting return sales. Sites like **Facebook** allow stores to establish "fan" pages where members can see new products, get directed to your actual website, and receive "status" updates where you can alert people to sales, new product lines, and new business developments. **Twitter** is similar, but more rudimentary. A user can update their "status", provided it stays below 160 characters in length. A good site for updating customers, Twitter can also host pictures, but they are given as a link. Though social networking sites are good for branding, they are not necessarily a clear-cut way to close sales.

The most important thing is to ensure that customers can reach you in a way that gets them answers quickly. In today's world, with its smorgasbord of social networks like **Facebook** and **LinkedIn**, online review sites such as **Yelp!**, and personal blogs like **Tumblr** and **Twitter**, its tweeting companion, it is extremely important to manage your reputation. Even when problems happen, you can often take actions that assure you that you have a happy customer who will recommend your business in the future. No better event can happen than to have a business with great "word of mouth" advertising. It is the cheapest advertising and most effective. For this reason, make sure your website and all of your assorted Internet pages have your phone number prominently displayed.

An offline strategy for fostering customer relationships is the tried-and-true method of mailing postcards, catalogs, and holiday cards. If your customer base is substantially composed of an older crowd, they will still check their physical mail often. Younger people rely more on email and websites, but this strategy may also work for some of them. Mailing out postcards is pretty cheap, and they can't ignore it as easily as an email, which may get stuck in their junk folder anyway. When you come out with a new product, are having a sale, or just want to remind your customers that you exist, send out a mailing. Local businesses can often use third-party providers in their neighborhood to create print ads for local newspapers or weeklies read by local buyers. Companies with a significant mail-order or catalog component to their business will require the skills of graphics artists and layout designers for media content that works well in print and online.

Keeping Customers: The IT Infrastructure

A successful small business in today's economy most likely needs a computer. Storing customer data, being able to retrieve it quickly and easily, and keeping track of customer payments and company bills are some of the jobs of a computer for the SBO, and without one, your business will most likely be at a serious disadvantage. The essential components of your information technology (IT) infrastructure are shown in Figure 1.

Customers today value speed of service, attentiveness, and overall excellent customer service. A business running their operations out of a composition book will not be able to satisfy the modern customer's needs. An SBO without a computer would have a serious problem with communication. Most people do not order by phone anymore. Many

customers order products in online stores or by email, sometimes while they are taking a break at work, or perusing the web over the weekend. Phone orders are much less of a spontaneous decision than online orders, and a smart SBO should take advantage of that.

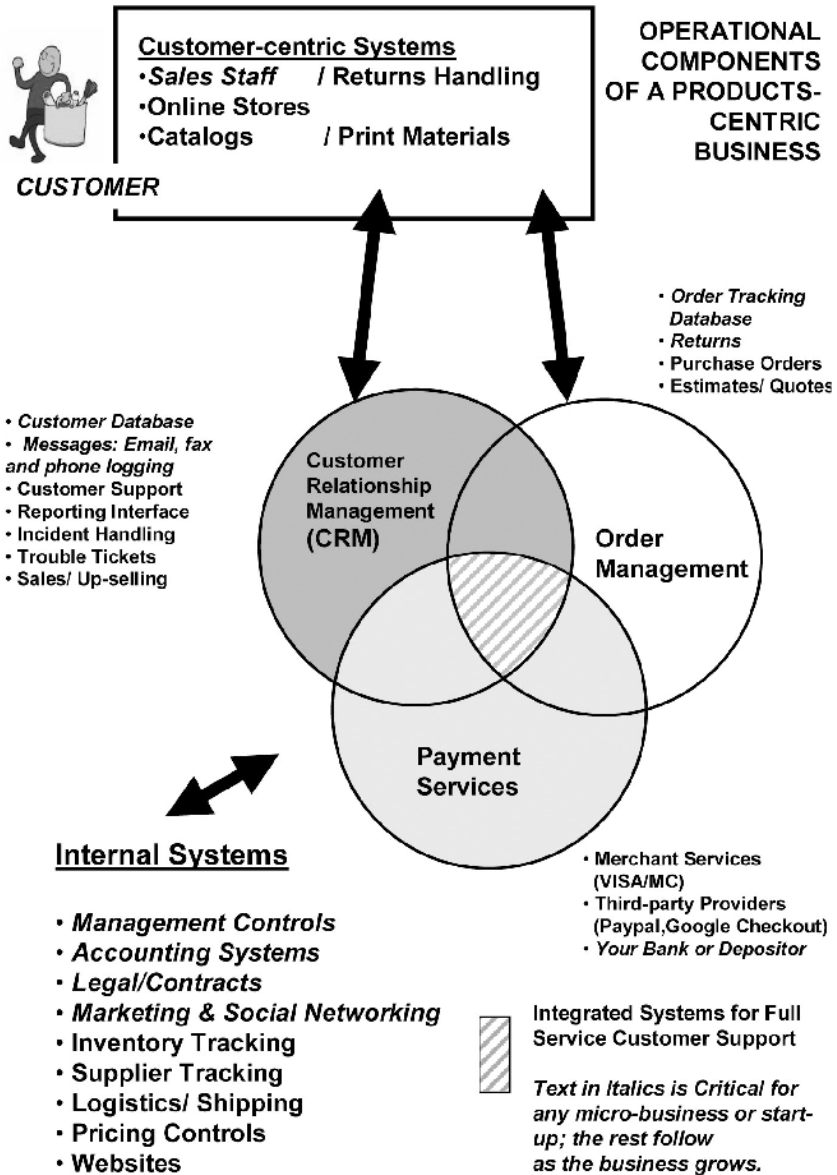


Figure 1. Operational Components of Small Business

The first step you should take is one you probably already have done, and that is purchasing a reliable computer, be it a laptop or a PC. Most SBOs, since they are running a business out of their own home, will probably find it most effective and financially responsible to use their home computer. If you have registered your domain name (as recommended in the previous section), you can go to your web hosting provider and set up email addresses, like orders@yourdomain.com. This way, forms from your online store can be funneled into this email address, making it easy for you to keep up to date on new orders.

Next is the network of information management systems. Since microbusinesses cannot afford to start operations with an extensive set of computer applications, they tend to add processing capabilities as they grow. These upgrades are typically funded through organic growth, through microbusinesses receiving venture capital or funding through partnerships, or through grants or shared services through incubators or non-profit organizations. There are three parts to the whole in information management: customer relationship management, order management, and payment services.

Customer Relationship Management

An email address is not enough in today's small business world. You need to keep track of your customers. You may want to know down the line how many customers are repeats, how many have requested literature on new products, or whether they are recommending you to their friends. If you plan on sending out postcards, coupons, or new product notifications, you will want to have a database of customer email addresses, physical addresses, and an order history. Also, if a customer comes back after a period of time and emails you about a new product, it creates a positive shopping experience for them if you remember who they are and have a record of their previous orders.

Tech Business A remarks: "We found that the easiest solution for us was to create our own CRM system, actively synced to our website."

There are many programs out there that provide the services that a SBO needs for customer relationship management (CRM). There are two types of CRM programs: desktop-based solutions and cloud-based solutions.

For the new startup, a simple desktop-based program like **Goldmine** should be sufficient. Goldmine is for the SBO that wants to graduate from using an Excel spreadsheet, but does not need a complex program with many

performance capabilities. Goldmine stores customer data, keeps a history of email correspondences and orders, and provides scheduling services and sales/marketing automations.

CRM in the “Cloud”: Low-cost CRM solutions for microbusinesses are changing with the advent of third-party services. Google Applications (aka Google Apps) is used by many small businesses to maintain contact information and e-mails with their customers. Instead of searching your email by keyword, as one would do in **Outlook, Eudora**, or other email client, you can view e-mails easily by simply looking up a customer. Want to send out blast messages informing customers of sales or specials? Many small businesses are now using third-party services such as **Constant Contact** to many e-mail promotions, or using **Zoho** to track and communicate with all their customers. These third-party services run and maintain the software that formerly had to be built and managed – at considerable expense – by the manufacturer. In this way, a cloud-based solution can represent a considerable savings in time and effort. The downside is, of course, that once you obligate to a service, it can be difficult to move. In fact, once a microbusiness gets to over 20 people, 1000 transactions a month, or \$400,000 in annual revenues, it is often better to move these CRM systems “in house”, or upgrade to a more robust CRM solution such as **SalesForce.com**, or **Oracle CRM on Demand**. However, in so doing, the price per user increases from \$20 per month to over \$50 per month, but performance and capacity are much improved.

Open Source CRM: Small businesses with in-house computer expertise have many more options. There are CRM solutions available as open source, meaning that you can acquire the source code for free and run them on your own computers. These open source products are upgraded collectively through the efforts of thousands of contributors, who make upgrades and share the upgrades with the open source community. Most open source software is made available through a company who provides enhancements to the open source software (at a fee), or provides hosting or consulting services for the open source software, thereby enabling a revenue model for the open source software approach that allows it to remain viable.

An example of this is **SugarCRM**, which touts more advanced reporting and analytics, as well as more in-depth automation software, allowing the SBO to take information about sales and turn it into recommendations for growth or improvement. It also syncs with LinkedIn, can work hand in hand with your e-commerce programs, and has plug-ins for **Microsoft**

Office. It also has a more intuitive customer data program, sorting through your older databases and organizing them, centralizing customer service. It has security features that restrict access to details to those with the “need to know”, and it also supports e-mail campaigns, import of mail lists, integration with online web forms, and many other useful customer management features. The biggest challenge with Open Source CRM systems is tailoring to meet in-house needs and protecting the security of the underlying database over any networks, including the Internet.

With so many programs available to SBOs, it would be wise to talk to any fellow entrepreneurs you may know about their CRM preferences. If you are a business that is using an incubator or a non-profit as an intermediary or mentor, you could also ask them to help you decide. Laying out an array of CRM ideas and discussing the pros and cons with your mentor may aid in your decision-making process. Depending on the product you sell, the customers you sell to, and the complexity of your market, you may need a simple program or a more complex one. Many companies graduate from one CRM program to the next once they grow a larger customer base, begin to establish additional manufacturing or sales cells, and so on. The choice may also depend on your personal level of technical expertise. The necessities your CRM program must have are:

- **Customer Database**
- **Messages: Email, fax and phone logging**
- Customer Support Reporting Interface
- Incident Handling
- Trouble Tickets
- Sales/Up-selling

Order Management

Understanding your business’ cash flow is key to a small business, and therefore it is necessary to keep track of your finances. You should already be doing so for your business expenses, so it makes sense to use the same program for your customer accounts (invoices, payments, and so on). Yet again, there are many programs to choose from in this department. A program like Intuit’s **Quicken** is what many homeowners start with, as it is a personal finance software that many homeowners use to keep track of family and personal finances already. Quicken breaks down spending in the household and can be synced with multiple checking, and savings accounts. Intuit also offers a more SBO-oriented program called **QuickBooks**, which offers more for the small business side of things. Once you begin to develop a substantial customer base, QuickBooks may

become the program for you. QuickBooks links with Microsoft Outlook for basic customer management, but QuickBooks is not a customer relationship management (CRM) system.

What is unique about QuickBooks is that it “grows with the business”, expanding when your microbusiness grows. QuickBooks also provides strong inventory and electronic data interchange (EDI) tools, so that products used within the manufacturing process, particularly those bought in bulk, can be tracked through inventory management tools. EDI allows the exchange of product ID or SKU numbers, pricing information, and availability between the manufacturer and his suppliers. QuickBooks also provides customizable invoices and the ability to generate quotes and estimates, so it is often the platform used by business owners to handle order management, vendor/supplier transactions, inventory management, and profit/loss analysis.

Deciding what program better suits you is always dependent on the type of business you run. With these sort of decisions, it’s best to ask other SBO colleagues for their opinions, and maybe even go online and find a forum on the internet to discuss the options. The key jobs your order management software must perform are:

- **Order Tracking Database**
- Returns
- Purchase Orders
- Estimates/Quotes

Payment Programs & Strategies

The last piece of IT infrastructure you need is a payment processor. You most likely will not need to purchase any sort of software, for there are several ways to process customer payments, most of them easily done online. You can always accept payments by check, but if you have an online store you can make a form where people to input their credit card information. Of course, this form needs to be secured; otherwise you are putting people’s money at risk. A way of avoiding the hassle of making your own secure form is by using a third-party provider like **Paypal** or **Google Checkout**, which take your customers’ information, process it, and deposit money into your bank account, taking a minimal percentage.

All small businesses need to start operations having a good relationship with their bank, whether it is a local bank or major national bank. Businesses need to be able to accept and deposit checks, and most small

businesses need to be able to process credit cards. In the latter case, the small business will need to augment their bank account with a merchant processing solution. This can be provided by their bank, or by a third party provider (such as Innovative Merchant Solutions, First Data, or even Paypal or Google Checkout). These third-party providers allow credit cards to be accepted by phone or over the Internet, and then, after a period of 2-3 days, the funds are “swept” into the manufacturer’s main bank account. Fees can vary widely. The typical merchant processor typically takes 2 to 3 percent of every sale (and more, if the customer is outside the USA). The manufacturer must take care to meet all customer obligations, or risk facing a credit card charge-back, which can mean that funds swept to his bank are removed by the merchant processor. Chargebacks also incur penalty fees, and can become quite costly to poorly run businesses. Manufacturers are also solely responsible for ensuring that the customer is legitimate; companies bear the full cost of credit card fraud. It is not covered by the merchant processor. Most importantly, manufacturers must ensure that they handle credit card data in a very secure manner. While beyond the scope of this report, all companies accepting credit cards must operate within PCI compliance standards, in order to continue accepting credit cards. Depending on how credit card data is acquired (on signed contracts, over the phone, over the Internet) determines just how onerous PCI compliance requirements can be.

Most small businesses can keep their compliance requirements small by using intermediaries such as Paypal, Google Checkout, or Yahoo stores as intermediaries to process the credit cards for online purchases. This is ideal when the company is very small, and transactions are limited. As the company grows, it can then augment its operations to include card swiping machines, telephone based processing, and secure payment solutions that integrate with their accounting systems. This approach is quite different if your shop also serves as a purchasing station for your product. If you have customers visiting your business, a point of sale system is necessary from the beginning.

Customer Service

While most microbusinesses integrate customer support within their CRM systems, it may be necessary to augment customer service with other information management solutions. For example, companies with technology products may want to start an online “wiki” or group discussion board, to assist with the setup or integration of their products. Companies may need to implement a dedicated phone service line for

trouble tickets or incidents with their products, while companies that ship products will need to add support for product damages and returns. Companies with higher call volume will need to add PBX-based services for telephone extensions and voice mail, and may use third-party providers, such as **RingCentral** for enhanced phone support capabilities.

The main thing to take home about an IT infrastructure is that **all three components need to tie together and communicate into creating an effective customer service machine**. Keep in mind that along with these programs working hand in hand, you also need your computer to be the hub for all of your other responsibilities, which may include:

- Management Controls
- Accounting Systems
- Legal/Contracts
- Marketing & Social Networking
- Inventory Tracking
- Supplier Tracking
- Logistics/ Shipping
- Pricing Controls
- Websites

Security Issues and Solutions

The first concern of a small business is **backing up**. Preserving your customer records, your business literature, and your financial history is imperative. Small businesses need to ensure their business can continue after a fire or flood, and that data records can be restored. You can physically back up your information by yourself, using a remote network drive, or you can use a third-party provider like **Elephant Drive**, that backs up your info onto their personal server, accessible from anywhere online.

In addition, businesses need to ensure that critical data is protected, via both computer-based and facility-based protective measures. Such measures might include locked doors, data access based on card swiping or password-based access methods, keeping critical accounting data off of servers connected to the Internet, firewalls placed between all computer systems and the Internet, in-house auditing procedures, data backup services, and good personnel procedures for detecting and preventing theft. This is but a small subset of what businesses must worry about. Managers must be diligent in determining what forms of security

risks may most likely affect their business, and work to put in place solutions to deter these risks.

Employee Theft

Many small businesses are plagued by staff “stealing from the till”, or removing proprietary data offsite. All small businesses need to be proactive on reducing employee theft. The theft can take many different forms. If you run cash registers, employees can skim funds, Employees with accounting access can modify transactions in the books to redirect deposits, or redirect funds to other persons. Companies with inventory or warehousing of finished products should watch for theft of products from loading docks or other lightly manned areas.

A variety of methods can be employed to reduce theft. This includes implementing stringent hiring practices, and not hiring those with troubled credit histories, history of alcohol or drug dependencies, or other criminal or civil crimes often associated with theft. Employees should undergo recurrent exposure to company practices – through procedures such as signing of employee handbooks – so that they know the company keeps an eye on theft. Strong physical security measures can be implemented, depending on the value of goods. This would include password or passcard operated access controls, keypad access controls, use of safes, restricted access points, security guards, sign-in and sign-out access at manned stations, physical inspections when leaving a facility, camera-based security systems, and so forth. Businesses that pack a high volume of boxes benefit from camera based systems in packing areas. Warehouses and business areas should have a higher level of security.

Businesses can also have employees steal their time. A small but not insignificant number of employees will use Facebook or other social networks on the job, will shop online at work, or will handle personal matters using company e-mail. Stopping time misuse depends on setting a work culture that severely disapproves of these types of activities. Not only should employees and managers be briefed on this behavior, but employees should be aware that firewalls are in place which archive their use of the Internet and e-mail systems. Those archives can be particularly useful when an employee who has been fired for Internet misuse claims wrongful dismissal.

Of course, with a microbusiness, one can only implement theft detection methods that are affordable. At the very least, areas with cash or sensitive data should be controlled under key, and monitoring cameras should be

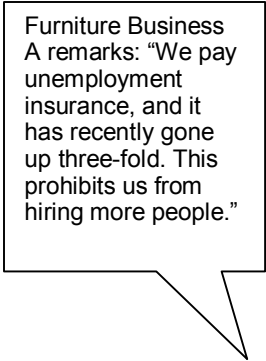
used in areas where there is a high probability of package or item theft. Managers should audit the accounting books on a quarterly basis, and examine bank records to look for unexplained or aberrant transactions. Passwords should be used to control access to critical applications. Employees should also be told regularly about workplace practices and workplace ethics.

It is hard for microbusinesses to find the time to take these steps. Sadly, it is often after a theft that owners will start integrating more disciplined workplace habits into the workplace.

Tides of Change: Proposed Policy Changes

Through interviewing SBOs in today's industry, my own personal small business experience, and research, there are a few things that could be proposed to better the small business environment in the U.S. If we are to bring light industry back into our nation, and ask it to provide a way out of our economic downturn, it seems only appropriate for our local, state, and federal governments to provide a favorable atmosphere for entrepreneurial growth.

- **Support entrepreneurs directly.** The government has yet to see the difference between the SBO of a practice and the SBO of a growth-motivated business. Too much time is spent creating intermediaries like incubators, venture capital funds, and non-governmental organizations for mentoring, while many SBOs solely interested in product development and sales are left to fend for themselves. . Though incubator programs can achieve results and help SBOs educate themselves and get their businesses off of the ground, I feel that direct financial assistance would serve the microbusiness community better. Practices contribute to the economy as well, and they deserve attention and encouragement. I have heard from many of my interviewees that a big part of small business is “making it happen”: getting the product on the shelf, out the door, and to the customer. If the government spent money instead on encouraging startups to flesh out their small businesses at home and get on the road to production as quickly as possible, it would be better in the long run for both the businesses and the economy than the strategies targeted only at growth-motivated businesses.



Furniture Business A remarks: “We pay unemployment insurance, and it has recently gone up three-fold. This prohibits us from hiring more people.”

- **Change worker’s compensation and unemployment insurance.** The upfront costs of worker’s compensation insurance often prevent entrepreneurs from hiring their first employee. For the light industrial sector, many microbusinesses will be considered to be “dangerous” businesses, resulting in exorbitant worker’s comp expenses. The increasing tendency of unemployment insurance is also causing SBOs across the U.S. to be discouraged from hiring new employees, resulting in the opposite of what the economy needs: a hiring stop.
- **Emphasis on continued positive savings plan policies.** More recent savings plans implemented like Roth IRAs for minors, Roth 401Ks, and the accelerated depreciation schedule allow microbusinesses to realize helpful tax benefits, as well as hiring benefits that do not result in dilution of their ownership interests. These programs should be continued and expanded to allow for two positive trends to continue: a growing saving population and a growing base of hiring in small businesses.

Furniture Business A remarks:
 “Wyoming has some great programs, funding me to go to tradeshows. This results in me hiring more employees.”

- **Continued support of SBOs and furthering of their education.** Programs for training workers and for sponsoring SBOs to go to business tradeshows encourages small businesses to hire more workers, develop more skills in their current employees, and further their own knowledge in their field.
- **Continued support from states through keeping the tax burden low for microbusinesses.** Many of the businesses that I spoke to are located in Wyoming, a very ‘friendly’ state for small business. With no corporate or income taxes, small businesses are able to fully blossom without much bureaucracy standing in the way. I encourage other states to take Wyoming’s lead and change their tax structure to help, rather than hinder, small businesses, new ones especially.
- **Better hiring incentives through welfare-to-work, Job Corps and other state-sponsored programs.** Many states have created job programs for those with mental disabilities, those below the poverty line, and those who are qualified for low-skill labor, offering businesses compensation in the form of exemption from payroll taxes or annual credits if they choose to hire employees from the program. More widespread acceptance and support of programs such as these will encourage SBOs to hire more people.

Retrofitting Your Facility: The Energy Issue

Maximizing performance & energy efficiency strategies

As a microbusiness has begun to set its operating processes in motion, the SBO will soon need to consider the space where they will conduct the production of their product. The production facility for most microbusinesses is often a readily available building or area in your house: many SBOs convert basement space, garages, mother-in-law apartments, barns, or other unused outbuildings into effective offices and workshops.

Before jumping into a home improvement project for your new workspace, it may be helpful to learn a bit about building performance, energy use and efficiency, and methods for saving money through smart building practices. A microbusiness running out of your workshop in your backyard may seem to be unrelated to the topic of energy conservation, but green building practices can be applied to any building, big or small.

By building green, your shop will be saving money every month on energy bills, and will also be improving the environment around your business. This section's intention is to educate the new SBO about designing their new workspace in an environmentally conscious manner.

Energy Conservation & Building Performance

Many new SBOs will be nodding their heads as they read this section; 'green' building is not a new concept, and many homeowners already employ environmentally sustainable practices in their homes by heavily insulating their walls and floors, using insulating curtains on windows, or outfitting their homes with photovoltaic panels to harness the sun's energy for heating their house or their water.

A well-performing business deserves a well-performing building. When a work environment has healthy air quality, easy access to natural sunlight, efficient use of space, and is built and furnished with non-toxic materials, employees are happier, call in sick less often, and productivity increases. If you have customers come to your space, they will also have a more positive shopping experience. Through your energy savings, you will also be able to save up more money for growth, be able to purchase more equipment, or hire additional employees, stimulating the economy in many ways.

The first concept to understand is that of energy conservation. Heating and cooling costs are the biggest chunks of a residential property's energy bill, while lighting is the biggest for commercial properties. A microbusiness is a combination of the two; your workspace may even be inside your house's walls. For the simplest reason, economics, it is imperative that your workspace consumes as little energy as possible for heating and air conditioning, and uses efficient light fixtures. By controlling the biggest energy hogs through smart design, your microbusiness' energy bill will eat up less of your working capital.

Economics aside, conserving energy in your workspace is responsible. Whether your political leanings are left or right is irrelevant; buildings consume a lot of energy, and there are simply not enough fossil fuels left to use anymore. Buildings use 70% of the U.S.'s electricity and emit 38% of the U.S.'s CO₂. To reduce your business' impact on the environment is not just an ethical thing to do; it is also one that improves your surrounding community, providing an example of responsible design and operation. By conserving energy, you help our country and our world move toward a future without dependence on fossil fuels, one where we need less and use less.

The next principle to be understood by a forward-thinking SBO is that of building performance. A building can be wonderful at conserving energy, but if it does not perform well, it is still not a very successful green

building. Well-performing buildings utilize effective insulation strategies, have heating and air conditioning systems, water heaters, and electrical systems that perform as well as possible, and are commissioned frequently to ensure that they stay at peak performance as the years go by. Other high-performing elements in a high-performing building would be well-insulated or reflective windows, an insulation of high thermal resistance (high R-value) in the walls of the building, and greywater recycling systems. These building performance strategies and applications will be further addressed in the section of the book about the EcoShop concept, where an SBO can bring together green building concepts into one environmentally conscious shop project.

The Economics of Energy Use

The ‘green’ revolution has begun, and with it, there are many questions that arise. Why should I spend money on green improvements? How much more will I have to spend on green retrofitting versus a normal building strategy? When will I get a payback?

The first question can be answered by looking at environmental consciousness in two ways: ethically and economically. You can decide to adopt green building practices because you genuinely care about the environment, the depletion of fossil fuels, the resulting need for energy conservation and use of renewable energies. This ethical responsibility is one reason, but for many SBOs, it may not be important enough; ethics does not put food on the table. The bigger incentive for microbusinesses is that green improvements save you money over time. Insulating your space and using compact fluorescent rather than incandescent light bulbs can save you money on monthly heating and electricity bills, while larger improvements like a more efficient HVAC unit will pay for itself over a few years.

The second question’s answer varies with the size of the project. In “The Cost and Financial Benefits of Green Buildings”, a report done by California’s Sustainable Building Task Force, they concluded that **“minimal increases in upfront costs of about 2% to support green design would, on average, result in life cycle savings of 20% of total construction costs -- more than ten times the initial investment.** For example, an initial upfront investment of up to \$100,000 to incorporate green building features into a \$5 million project would result in a savings of \$1 million in today’s dollars over the life of the building.”

For a microbusiness, the savings would be on a smaller scale, but still significant. A 2% increase in construction or retrofitting costs would be minimal for a garage or shop, and the tenfold return on the investment would be a welcome windfall for a conscientious SBO.

The third question also varies with the size of the project, but is more complicated in that it varies based on every component of your building. As mentioned previously, larger systems like photovoltaic panels, wind turbines, and efficient HVAC systems have larger upfront costs and will therefore take a considerably longer payback period than a compact fluorescent light bulb or a high-efficiency window system. At the end of the last section of this book, I will conduct a cost analysis which will make it more apparent the costs, benefits, and payback periods for different green building components.

LEED, Passivhaus & Living Buildings

There are several standards that green buildings can be held to, and there is yet to be one that is universally adopted. In this section, you will be introduced to the largest player in the green building rating industry, Leading in Energy and Environmental Design (LEED), the energy minimalist Passiv Haus building methods in Germany, and the new rigorous Living Building standard started in Seattle, Washington, which is even more stringent on energy use.

I am not suggesting that every SBO needs to achieve the highest green rating for their shop; that may not be necessary and may be impossible given your personal amount of capital, space, time, and so on. The intention is for you to see what the best green buildings utilize to achieve such high ratings, and to perhaps inspire you to adopt a few of their goals.

LEED

The go-to rating system for the U.S., as well as many countries in South America, Europe, and Asia, LEED is a points system based off of the architect's self-reporting of the building's design, construction, and future performance. Points are distributed across major credit categories, with each category split into several subcategories. Prerequisites in each category receive no points and are mandatory for all projects.

In more detail, there are six credit categories: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and Innovation and Design Process. Within these

categories, there are smaller subcategories that explicate the different goals, efficiencies, and performance criteria of different components of the building.

Out of 100 total points as of the 2009 version, LEED ratings range from the minimum achievement of Certified (40+ points), up to Silver (50+), Gold (60+), and finally Platinum (80+). There are also 10 bonus points available for Innovation in Design and Regional Priority.

Disadvantages to the LEED system are:

- Points are not taken away, which results in construction or performance practices that are not considered 'green' to occur without consequence.
- Pursuing LEED accreditation results in an increase in design and construction of the building.
- LEED does not take into account the local environment of each building effectively, essentially treating all building projects the same.

Advantages to LEED are:

- A LEED certified building is considered to be of superior quality, often increasing the property's worth and marketability.
- LEED certified buildings are designed to use resources more efficiently when compared to conventional buildings simply built to code.
- LEED certified buildings often provide healthier work and living environments, which results in higher productivity and improved employee health and comfort.
- The higher design and construction costs of sustainable building result in savings down the road. Studies have suggested that an initial up-front investment of 2% extra will yield over ten times the initial investment over the life cycle of the building.

Passivhaus

The Passivhaus building strategies in Germany have been popular for many years, and remain the minimum building standard for most environmentally-conscious German dwellings. The Passivhaus principles embrace super-insulated structures that consume far less energy than their average American counterparts, resulting in a design process that

concentrates on minimalism in all areas: lighting, heating, cooling, and so on. The main standards of the Passivhaus design are:

- The building must have an annual heating demand of not more than 15 kWh/m² per year (4.75 kBtu/ft² per year) in heating and 15 kWh/m² per year cooling energy. This is between **75 and 95% less energy** for space heating and cooling than current new buildings that meet today's U.S. energy efficiency codes (around 43.7 kBtu/ft² per year).
- Total primary energy (source energy for electricity, etc.) consumption must not be more than 120 kWh/m² per year (37.9 kBtu/ft² per year)
- The building must not leak more air than 0.6 times the house volume per hour.

With these standards in mind, Passivhaus buildings are very low-maintenance from an energy standpoint, very economically efficient, and considered to be “tight” buildings, keeping the air in the building inside.

This makes sense, for once you spend the money and the energy to heat up the air for a house (or cool it down in the summer), it is a waste to have it just leak back out. A money-conscious SBO might take Passivhaus standards into mind if they live in a cold, heating-heavy climate.

Living Building Challenge

A group in Seattle, Washington, was not satisfied with the bar that LEED sets for green buildings, so they decided to make their own standard, called the Living Building Challenge. A key difference between LEED and the LBC is that no points in the LBC are optional: for a building to be considered a Living Building, it must satisfy every requirement. That said, for each requirement there are exceptions and ways to make up for impossibilities due to your site size and limitations, the area the site is in, and the type of climate.

The most difficult requirements of the LBC are:

- the building must be **net-zero energy**, which means that per annum, the building must produce as much energy as it consumes
- the building must be **net-zero water**, which, similarly, means that the per annum, the building must collect and/or produce as much water as it consumes through rainwater catchment systems,

sensible river diversion, or, if neither of those are feasible on-site, offsetting the building's water usage by harvesting water naturally off-site.

The net-zero energy goal can be met in several steps. First, design the building so that it conserves as much energy as possible. Orient it so that it gets as much heat and light from the sun, super-insulate the walls, and keep the building tight. Second, use renewable energy to generate the energy needed to offset the building's use, through photovoltaic panels, wind turbines, or water mills.

The net-zero water goal is much more difficult to satisfy. Rainwater catchment systems can provide only so much water from your site. Also, local health regulations may prohibit the consumption of treated rainwater. For this reason, the LBC offers an alternative, called "scale jumping", where the building owners can use land off-site to make up for their water use on the actual building site.

The other categories in the LBC, called "petals" are site, health, materials, equity, and beauty. A few key requirements from these categories are:

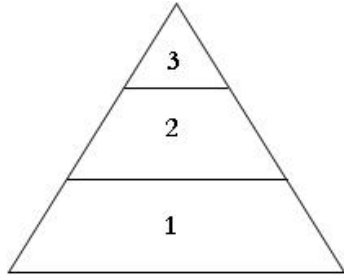
- The site for the building must not be on previously unused land. Virgin farmland, wetlands, old-growth forests, and 100-year floodplains cannot be built on.
- For each hectare of development, an equivalent area of land must be set aside for habitats.
- Every occupied space must have operable windows for access to fresh air and sunlight.
- No materials on the "Red List" may be used in the project (scale jumping can be used if this is impossible). These materials include PVC, formaldehyde, lead, mercury, CFCs, and cadmium.

Pursuing the title of a Living Building is one that requires considerable changes to the usual building and renovating procedure. What makes this a great opportunity for microbusinesses is the small scale of their construction projects. By starting with a small building like a workshop, achieving the Living Building title is within an SBO's reach. Even if actually becoming a Living Building is impossible for financial or size reasons, the Living Building goals can be applied to a shop to great benefit to the SBO, the employees, and the community.

The Energy Use Pyramid

There are three key steps to reducing energy use in your building, ideally to net zero.

- First, **don't use power.** Obviously you cannot just stop using power entirely, but you can reduce your load on the grid by downsizing the building and the systems in it, making your building tighter, and so on. These strategies and many others will be elaborated on in the next section of the book.
- Second, **use power in an efficient manner.** Upgrade your appliances to younger, more efficient models. Install LED or compact fluorescent light bulbs. Put in insulated windows.
- Lastly, **produce your own power.** Use a wood-burning stove for heat. Install photovoltaic panels to heat your water. Utilize a wind turbine to generate electrical power.



Using these steps, your shop can be on the road to becoming what I call an EcoShop, a workspace that is green, efficient, and better for the environment than the conventional workshop. Microbusinesses across the nation can attempt to become greener, and the next section will give you an idea about how to begin your journey.

The “EcoShop” Improving your environment: Simple ways to make your workspace ‘green’

The previous section gave you a quick look at the green rating systems, perhaps inspiring you to adopt some of their strategies for sustainable buildings. Now it is time for you to apply this to your workspace.

This section is meant to go beyond the normal shop retrofitting procedures. As an architectural engineer interested in energy efficiency and ‘green’ buildings, it seems obvious that the microbusiness sector holds a unique opportunity for leading the way in green building retrofitting and construction. Since the buildings of a microbusiness are small, building smartly is not a large-scale idea that an SBO could not afford. On the contrary, green retrofitting for a microbusiness would save the SBO a lot of money, as my cost analysis at the end of this chapter will attest.

When approaching the project of revamping your new microbusiness space, take these energy-saving strategies into account, and they will result in more than just saved money: happier employees, better customer service, and satisfied customers.

Revamping an Old Space: “Adaptive Reuse”

There's a popular saying amongst both architectural engineers and those involved in renovation of historic buildings: "The greenest building is the one that is already built." If you already have buildings on your property that are still standing, yet maybe a little run down, it makes both financial and sustainable sense to revamp the existing building rather than build a new one from scratch. Keeping an older building also contributes to your local area's cultural sustainability, for even if your old barn is not a historic property, it still keeps your local history alive. Rather than tearing it down, fix it back up!

For the SBO looking to take a space they already own or currently use and retrofit it, making green adjustments is easy, and on a manageable scale. Let's say you have an outbuilding on your property: an old barn, a workshop, or a mother-in-law apartment. The largest things to address for an existing space are green building strategies that can be implemented without much destruction of the existing building. Some of the ideas addressed later in the section that would be of most benefit to an old space are:

1. **Insulation.** Most barns and older workshops aren't built for full-time human occupation, and therefore can be quite drafty. To make a minimally insulated space more energy efficient, installing some high R-value insulation would greatly reduce your heating bill. Another thing to consider would be filling any gaps between the walls and the floor, the walls and the roof, and around the windows of the space.
2. **Recycling & Composting.** An existing space is an example of recycling in itself, through the concept of embodied energy. By keeping the main components of the building (walls, foundation, integral systems), you are reusing and recycling. Also, with an existing space, it is very easy to implement a recycling and/or composting program for your shop. Lots of packaging can be recycled, like broken down corrugated cardboard boxes. Wood scraps can also be recycled or used for a compost pile. Any organic material can be set aside on a piece of your property to make compost, which is great for fertilizer, and keeps more waste out of landfills.
3. **Water catchment.** Putting in a rainwater cistern is an effective and simple way of recycling water. With a shop, much of this water could be utilized in your shop's sinks and toilets. This could even make it possible for a shop to be net zero water if you live in an area with a good amount of precipitation year-round. Installation of a catchment system does not require much more

than a drainage pipe system from your roof down to a barrel or other vessel for water storage.

- 4. Installation of more efficient appliances, light bulbs, and windows.** These components are easily accessible, for the most part, and don't require much destruction of the current space to be replaced. The specific things to look for on higher-efficiency products will be addressed later in this section.

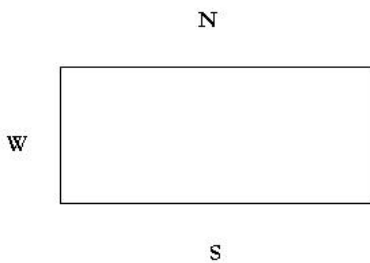
Starting from Scratch

By having a virgin space for your new workshop, there is the opportunity of nearly unlimited possibilities for green building. Without the limits of an existing structure, you can make building decisions like solar orientation, foundation thickness, and window placement that you cannot do feasibly with an existing structure. For this reason, there is not a 'best' way to go about building a green shop; all of the following strategies are effective and it is up to you which ones you want to employ in your new workspace.

Design & Layout of the Shop

If you are dealing with a completely blank slate for your space, there are a few things to consider before even thinking about the floor plan of your shop. If you already have a space, like a basement or an existing outbuilding, some of these ideas may not be applicable.

The sun is a great source of energy, and your shop can take advantage of that by considering its solar orientation. By orienting the building correctly, using the appropriate amount and type of glass, and employing suitable shading, you will have a building that heats up during the day and cools down during the day at a reasonable pace and to a comfortable degree. A concept that must go hand in hand with solar orientation is



thermal mass. A larger mass will heat and cool slower than a smaller mass, and by applying this to your foundation and some walls, you can build a shop that retains the heat of the day in the concrete foundation, heating it in the evening.

So, to start off, face your building, if possible, south (provided you are in the northern hemisphere). The building will best utilize the direct sunlight

if its 'front' is facing that direction. Depending on where you are located, the angle from true south that would be best will vary. Having direct solar gain can be problematic, leading to overheating during the day. By tilting the building's solar orientation to 22.5° off south, you will reduce the solar gain by 8%. Playing around with the angles may aid in perfecting your building's amount of solar gain. Solar data can be obtained online and then analyzed using a program like **Climate Consultant**. Once you have decided on an orientation, pair it with a concrete foundation of at least 6" thickness. Now, when the sun comes in during the day, it will heat up the slab, which will then release the heat slowly into the evening, after the sun has set. That way, you won't have to spend money on heat during the evening or night.

The building's shape is also something to consider. An elongate shape oriented east-west as shown has proven to be the most efficient for solar gain purposes. If this is not possible on your site, attempt to design your shop with solar geometry in mind: keep the shape of your building as close to a cuboid as possible.

The next thing to address is the amount of glazing. More windows should be on the south side, to allow for the direct sunlight to heat the rooms. Less should be on the east and west because the glare during morning and evening due to the rising and setting of the sun can be harsh. Sunlight from the north is well-diffused, so it is up to you how much glazing should be on that face.

Once you have glazed your space, you need to consider shading devices. Sometimes direct sunlight is not the best thing for a space; if your workspace is overheating and there is excess glare, shading devices need to be blocking some of the sunlight. During winter, this is likely to not be a concern, as any solar gain is welcome to offset heating costs. In summer, the case is different, and sunlight isn't needed to provide heat. For this reason, shading devices to block the summer sun's rays can be installed onto windows. What is nice about shades like overhangs or window slats is that the angle can be decided upon so that the shallower winter rays can get in, but the higher summer ones cannot.

Once these factors have been decided, it is time to start thinking about the layout of your shop. Where will you be working? What amount of storage space will there be? Are there effective areas for people and products to be transported and enter and exit the building? Where do you want your sinks and toilets? Where do you want the windows? How many will there be?

A good way to get answers to these questions is to draw what you think you want, keeping in mind your space limitations. Start off vaguely, by drawing the edges of your space, and filling in with bubble drawings. Label where you want circulation of people or products to be, where work stations, storage, sinks, toilets, dust collectors, and so on should be. Then you can make your ideas more detailed: add in door and window locations, the size of counters, machines, and shelving. The biggest things to keep in mind are:

- Access to natural light and air through window placement and work stations near the perimeter of the building
- Sensible organization of workspaces vs. personal space (if using an already existing space inside your home)
- Consolidation of activities: separate production, packaging, and shipping space, as well as an isolated computer area

Materials Analysis: The Effect on the Work Environment

It doesn't matter if you are building a new workshop from scratch or making alterations to a currently existing building, materials matter. Choosing what you put in your workspace in a more intelligent manner can reap many benefits: a healthier work environment, a more aesthetically pleasing space, and a better maintained ecosystem. There are many different materials that go into a workspace, and there are better choices you can make for each one:

- **Paint:** The average paint is filled with chemicals, many of them toxins or carcinogens and all of them bad for your lungs. The good news is that there are better wall covering products out there, the bad news is that a) they are more expensive and b) many of them mislead consumers. Lots of paint companies are jumping on the green bandwagon and touting their paint as "low-VOC" (volatile organic compound), but in reality, their VOC levels are still quite high, just lower than their other products. In your average hardware store, the best bet you can find is **Mythic Paint**, a completely non-toxic, VOC-free paint; so healthy you can actually eat it (not something they recommend). Most paints have an off-gassing period of years, in which they emit VOCs and toxins, even after drying. Since Mythic has no VOCs, it has no off-gassing period. Since you and your employees will be spending a fair amount of time in your shop, looking around for a healthier wall covering might be a good idea.

- **Stains and Solvents:** Many solvents like paint thinner and turpentine are toxic and very damaging to the environment if not disposed of properly. A way to avoid injecting these materials into the landfills is to buy water-based stains or turpentine alternatives. Just as there are many companies that make non-toxic paint, there are many “eco-safe” stain and solvent manufacturers. For example, **Bioshield** makes many environmentally friendly wood stains, and Union Rubber makes **Safe Klean**, a turpentine alternative. Ask your local hardware store if they sell similar products, or check online.

Furniture Business A remarks: “As one of the founding members of the Sustainable Furniture Council, our company only uses water-based solvents and stains.”

- **Wood:** The first recommendation I would give about wood is: get real wood. Many wood imitations like particle board are coated with resins that are formaldehyde-based, which raises safety concerns because formaldehyde is a known carcinogen. Using real wood is another good recommendation for an SBO that will be spending a good amount of time in their workspace. The second recommendation for wood is: get certified wood. Certified wood producers manage their forests in a conscientious manner, complying with responsible forestry standards. By buying certified wood, you are ensuring that your shop is not decorated with wood supplied by rainforest deforestation.

Furniture Business A remarks: “All of our wood is procured locally from sustainable forests.”

- **Plastic:** Many components of a building require plastic, plumbing piping especially. The problems with plastic are multifaceted. First of all, it is a fossil fuel-based material. Using renewable resources like wood and metal is a more environmentally responsible thing to do, but with plumbing pipes, there is not really an alternative. The second qualm with plastic is that it has hazardous chemicals in it, one of which, Bisphenol-A (BPA), interferes with hormone levels in humans. According to the EPA, PVC’s vinyl chloride content can be attributed to “cause or contribute to air pollution that may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible or incapacitating reversible illness.” The good news is that PVC is beginning to not have the monopoly on plumbing products. PVC-free products have been cropping up; no, you don’t have to resort to copper or lead piping to avoid using PVC. High-density polyethylene (HDPE) has begun to be used as a

PVC alternate, and some companies offer recycled HDPE as a piping product. Though it is still a petroleum-based product, HDPE is recyclable, unlike PVC.

Beyond individual evaluation of materials, the larger concern is educated buying, and that involves understanding the concept of embodied energy.

Embodied Energy: The Hidden Cost

When you go into a hardware store and purchase a 2x4, you spend a certain dollar amount. But what you are also spending is energy. Relatively unbeknownst to the average consumer, the 2x4 started as a tree, which was cut down using a saw powered by gas, most likely, and then was transported in a gas-powered vehicle to a mill that uses electricity, and then transported again and again until it ends up in their hands. Then you drive the 2x4 home. This concept is called “embodied energy”, the energy used to bring the product from start to finish.

For this reason, buying locally is a very responsible thing to do, for you are reducing the embodied energy your workshop has consumed. Limiting yourself to a 500 mile radius for materials is adequate for a location that doesn't have a lot of local resources. For some locales, you may be able to limit yourself to a 100 mile radius.

Using recycled materials is also a good strategy for reducing your embodied energy ‘costs’. Many recycled plastic products exist for wall coverings and furniture, some composed of recycled water bottles, plastic bags, and so on. Recycled scrap metal is also another innovative wall covering solution.

Lowering Energy Usage: Insulation & Insolation

Beginning at the base of the energy use pyramid, the first step towards a net-zero energy building is reducing the energy that the building uses to begin with. Two methods for accomplishing this goal are insulation and insolation.

If you are going to be spending money and consuming fuel to heat and cool your building, it is sensible to try and keep the outdoors out and the indoors in. By using insulation in your walls and roof, you can prevent your building from leaking out heat during the winter and letting heat in during the summer. The key thing to consult when choosing insulation for your space is the R-value, the level of thermal resistance of the

insulation. The higher the R-value, the better insulated your space will be. Building codes specify a relatively low R-value, but building strategies like Passivhaus encourage use of twice or three times the R-value of conventional spaces. There's really no such thing as too much insulation. If you are constructing a building from scratch, you could consider building it out of structurally insulated panels (SIPs), which serve as structural components but also have high R-value insulation built in.

Another thing to consider when buying insulation is the material you plan to insulate with. You can always go the synthetic materials route, but there are many new manufacturers on the market who produce insulation made out of natural or recycled materials such as denim from old blue jeans, compressed plastic bottles, or hay bales. Rather than buying the conventional insulation that has high embodied energy, it is better to look for more environmentally conscious alternatives.

Paired along with heavy insulation is the effective use of insolation, the radiation generated by the sun's rays striking your building. The key to manipulating insolation is the smart use of glazing on your south face. By installing large vertical windows on the south face of your building, the radiation of the sun will be maximized, heating the house in the winter and minimized in the summer. Insolation levels vary with locale, so it would be helpful to look up your monthly averages online. Knowing these values will also help with calculating the power generation of your photovoltaic cells, if you choose to install them.

By using the sun's energy to heat your house, and then preventing that heat to escape, you cut down considerably on your building's energy use. After you do this, you can implement the second and third parts of the pyramid: efficient power use and personal power generation.

Efficient Systems & Power Generation

Once you have lowered your shop's energy usage to as close to zero as you can get, the next step is to install high-efficiency systems or retrofit current systems to improve their efficiencies. The main systems in your shop will be the air system (heating and cooling), the lighting system, the window system and the water system. The machines involved in these systems should be performing at the highest efficiency possible in order to conserve as much energy as possible.

Air System

The machines that heat and cool the air for your shop will account for much of the energy consumption of your building, so it would be wise to think outside of the box when considering HVAC systems. The most generic method for heating and cooling air is to take the outside air and run it over a heating coil or a cooling coil depending on the desired indoor temperature. Once the air has been circulated in the building, it is rejected as return air and new supply air is pulled from the outdoors. The problem with this technique is that the return air is still closer to the desired temperature than the return air, and is being rejected, wasting the usable energy that it still retains.

To take advantage of this usable energy, you could use a heat exchanger in your shop. Shaped like an X, heat exchangers take the return air and use it to preheat the supply air before it hits the heating coil. In this manner, you can preheat cold outside air from 30° to 60° before even using energy for the heating coil. Similarly, in the summer, you can reduce the supply air's temperature before it gets further cooled in the air handling unit.

Tech Business A remarks: "Our data center has over 50 servers, and those generate a lot of heat. During the winter, we use the hot air from the servers to heat the basement, using the cold ambient air from the outdoors to cool them down."

Some shops can even take advantage of the heat the machines in their shop generate, siphoning the hot air into the air handling unit and using it to preheat the supply air. Machines like pottery kilns, computer servers, and other heat-generating machinery can be used to your energy bill's advantage.

The second consideration for your shop is the concept of the comfort zone. In the summer, Americans in my region will tolerate an indoor temperature range of around 74°-81°, with a relative humidity of around 20%-60%. In the winter, the comfort zone moves to a colder temperature range of 69°-76°, with a relative humidity of 25%-75%. A quick and easy way to reduce your energy loads during these seasons is to change the definition of your shop's comfort zone. If you let the thermostat sit at 65° or lower instead of 70° during the winter, you will be saving energy. Similarly, if you only turn the air conditioner on once the temperature reaches 80° rather than 75°, you will also save energy. Redefining the comfort zone in your shop may require you to wear an extra sweater in the winter, but it will benefit your energy bill and the environment in the long run.

Lighting System

Deciding on lighting in your shop is a simpler consideration. Your shop may be small or large, but using efficient lighting is an easy tweak to make on either an existing building or a new project. If you are attempting to make green alteration for a lighting system, there are several steps to implement:

1. Turn lights off when they are not being used.
2. Use natural light from the sun when possible (daylighting) using windows and skylights.
3. Decide where you need ambient lighting and where you need task lighting.
4. Decide what type of bulbs you will use: halogens, incandescents, compact fluorescents, etc.

The old and inexpensive method for shop lighting is to use incandescent or halogen bulbs, or fluorescent strip lighting. This is a quick and dirty way to light up the space, but it does not take into consideration the use of daylighting, the difference between ambient and task lighting, nor does it account for the glare associated with those types of bulbs. For a more green approach to shop lighting, take into account the four steps enumerated above.

First, make sure your shop has easily accessible controls so you and your employees can turn off lights when they are not being used. Adding dimming switches can also reduce your energy load, so when a task doesn't require full brightness, you can dim the bulb.

Second, take advantage of the sunlight during the day. Placing skylights above task workspaces may reduce the demand for electric lighting during the majority of the workday. Placing computer workspaces near to windows on the north side of the building may also be a good idea, as the reflected and diffused sunlight from that side would provide the space with nice ambient light.

Third, after arranging the floor plan for your shop, you will have noticed that areas where you and your employees will be working on production tasks will have isolated themselves from areas where less intensive tasks, like shipping or computer areas, are located. High-intensity tasks require appropriate lighting; bright bulbs paired with focused fixtures will light the area well so that skilled tasks can be easily performed. Supplementing task lighting with day lighting will reduce your energy load. More general tasks don't require the same intensity of lighting, and areas where those sort of

activities are performed can be completely lit with daylight, and when the sun has set, require lower wattage bulbs with more diffuse fixtures.

Finally, there is the last decision about what type of bulb to use. Incandescents are the cheapest bulbs on the market, but they are the worst from a green standpoint. They produce a lot of heat, wasting energy that could be going to illumination. They are therefore grossly inefficient, and are most likely a bad idea for a shop aiming for net-zero energy. Halogens work well at any temperature, but their efficiencies are nothing to write home about, so their best application is for outdoor use.

Fluorescents of both types, standard and compact, are the best alternative to any indoor lighting. Standard fluorescents have a blue-tinged light which often flickers and also make a humming noise, so install these wherever you are looking for stark lighting: storage spaces, manual labor areas, and so on. Compact fluorescents offer a much more ambient light and are more pleasing for more meticulous work spaces, computer areas, or places where you will meet and greet with your customers.

Window System

There are many types of windows on the market, and depending on your climate, your daylighting needs, and your building's solar orientation, there are different window specifications you should understand. There are three key things to consult before buying a window, and they are: the solar heat gain coefficient, the U-factor, and the visible transmittance.

The solar heat gain coefficient (SHGC) is an important consideration, for it denotes the percentage of heat transmitted through the window. In a cold climate, you want the sun's radiation to heat up your building as much as possible, so a high-SHGC window would be recommended. If your building is in a hotter climate, a lower-SHGC window might be a better idea.

The U-factor of a window is the rate of heat transfer between the indoors and outdoors. The U-factor is the inverse of the R-value, so in this case, the lower the U-factor, the better. A single-pane window assembly has a U-factor of around 1.1, while a high-performing Superwindow has a U-factor of only 0.22.

Finally, if you are considering daylighting your workspace, the amount of light that is allowed through the window is another thing to consider. The

T_{vis} or VT is given as a percentage on the window assembly, and the higher the better for daylighting.

Other characteristics of windows include the emissivity, the reflectivity, and the tint of the glass. In a sunny, hot climate, having tinted or reflective glass helps reduce glare and heating of the building by the radiation of the sun. In colder climates, having low-emissivity (low-E) glass is a good idea, as it reduces the heat that radiates out of the window assembly. The air leakage of the assembly is also another statistic to keep in mind, no matter your climate.

Water System

Water is fast becoming a precious commodity. With this higher demand and lower supply, water is going to be more expensive in the future, especially in the West. Conserving water is not only a great way to save money, but also a way to reduce your impact on the environment, especially if you live in a rainy area. If you live in an arid area, don't worry, there are things you can do as well to reduce your water consumption.

The first thing to do before considering the actual plumbing components of your water system is to think about the ways in which you are going to reduce your water demands. There are going to be several things in your shop that require water: the toilet, the sinks for cleaning tools, and perhaps sinks for water consumption (in a kitchen perhaps) in your shop.

First, you must understand the difference between greywater and pure water. Greywater is lightly treated water not meant for consumption. Rainwater, water from nearby rivers or streams, or water from appliances like showers, sinks, or washing machines can be utilized as greywater for several plumbing systems in your shop. Your toilet does not need pure water, nor does the sink in which you will be washing tools or paintbrushes. Pure water is needed if you have any plumbing components in your shop that are going to dispense water that will be consumed by you or your employees.

Toilets with lower water demand are currently being used both domestically and commercially. Waterless urinals are also on the market. Using either of these appliances would greatly decrease your shop's water demands. Another idea that is being spearheaded by many green building activists nowadays is the water-free toilet, the composting toilet. This type of toilet does not have a demand for water at all, nor does it need to be connected to a septic tank. Not to be confused with an outhouse or pit

latrine, composting toilets dispose of waste through aerobic decomposition (composting), and protect ground water from nutrient or pathogen contamination as well as provide optimal nutrient recycling. There are many systems, either manufactured or easy enough to build yourself, but all are hygienic, odor-free, and low-maintenance. Using a composting toilet in your shop would be a great green addition.

Once you have decided which components in your shop need pure water or greywater, you can begin organizing your plumbing system. Implementing a water catchment system for the greywater components in your shop is a great idea, and with the relatively small water demands of your shop, it may be feasible to completely supply these components year round with recycled water. Routing rainwater from your roof down to a container for storage, and then installing piping which feeds into your sink or toilet system, you can easily use the rainfall for cleaning your tools, flushing your toilets, or watering your shop's garden or yard.

HVAC Systems & Air Quality

Discussed already in a bit of detail, HVAC systems are a big consumer of your shop's energy, and so making them as efficient as possible is a priority for a green shop. Another consideration is the air quality in your shop. If you are manufacturing a product that generates a lot of dust, uses stains or paints that are toxic, or generates unpleasant fumes, you must think about some ways to improve your shop's air quality. Inhaling dust or fumes is bad for you and your employees, and creates a bad work environment. There are three things to work on in your shop to keep you and your employees healthy and happy:

1. **Ventilation:** Easily operable windows on at least two sides of your shop are necessary for good cross-ventilation. This keeps the air in your shop from getting stagnant, and helps get fumes out of your work area quickly.
2. **Filtration:** Cleaning the air before you reject it into the environment is a good idea, if you are going to be exhausting dusty air or air filled with volatiles from paint or stains. If any of your exhaust air is to be recycled, filtering it before injecting it into the supply air is a good practice.
3. **Collection:** If you are using machines like circular or table saws, collecting the wood, PVC, or metal dust is pragmatic, and keeps the particles from floating around your shop for you to continuously breathe in. A good dust collector would be a nice addition for your shop.

4. **Protection:** Wearing respirators is another good idea for you and your employees. If you are to be painting or staining your product for a few hours, it is wise to wear a mask for that period of time. Chemicals like paint stripper, PVC glue, and others are not good to breathe in, so protect yourself with a N95 mask with filters for chemical vapors. When working with wood and metal, ensure that your mask protects you from particulates.

Electricity: Your Power & Wiring Solutions

Obviously the greenest way to build your product would be to avoid using power tools at all costs, but that is impossible for many light industry businesses. If your shop will be powered with electricity from the grid, the first thing to find out is where your power is coming from. Many power suppliers allow you to choose to have your power come from a local wind farm or hydroelectric plant. Depending on your personal opinion on different renewable energies, you may be able to opt out of having your power come completely from coal or natural gas.

If you are going to produce your own power, there are two popular methods that are widely used in the U.S.: photovoltaic solar panels and wind turbines. Other fuel like wood and biofuel can be used for heating your building, but for generating DC electricity that can then be converted to AC for use in your building, these two methods are tried and true, and either or both can be applicable in pretty much every region of the United States.

Photovoltaic (PV) cells can be used for two applications, generally: to heat the water in your building, or to generate electricity. Arrays of cells can be very expensive, and when the technology was still brand new, the payback period was around 5-8 years. Nowadays, the payback period for the upfront investment can be as low as 1.5 years. The electricity that PV cells produce is DC, and requires an inverter in order to be turned to AC, which your home can utilize as power. This incurs a 4-12% line loss due to the conversion.

Wind turbines generate DC power as well, and are also a hefty investment for a new SBO. A small domestic turbine runs around \$10,000, but saves \$50-100 a month depending on the wattage of the system (usually 5 kW or 10 kW). If you have net metering and have average annual winds of at least 15 mph, a system *can* pay for itself in as few as 6 years, but a more realistic estimate is closer to 10-13 years.

Once you have decided on the method for your energy production and supply, you need to arrange the wiring in your building. If you are going to install many power tools in your shop, it may be wise to consider simplifying your wiring by consolidating the machines in your shop, arranging them all in one area. The “extension-cord problem” can be avoided if you just draw up a sensible design of where your machines will be located. Stay pragmatic: keep your dust collectors close to your saws and painting/staining stations, keep computers out of the production area. Having one electrical system for your computers separate from the system for your tools may be a good idea. Don’t forget surge protectors!

Safety Practices

The next two sections address the safety of you and your employees, how your shop affects the environment, and how you can minimize your impact on the local surroundings of your workspace.

Encourage a safe work environment. Personal safety should be an imperative in your shop. If your shop is to be green and encourage sustainable practices with respect to the environment, your workspace should also encourage healthy practices in-shop as well. Protect your eyes with goggles, protect your lungs with masks, protect your ears with hearing protection, and protect your body with appropriate work clothing. Take precautions with easily available first aid kits and eyewash stations, as well as emergency stop buttons on **all** machines. If your power tools are outdated, you may be putting you and your employees at risk, so retire old tools when they no longer meet safety standards.

Be kind to your surroundings. There are seemingly invisible ways you can harm your local environment, two of which you can do much to prevent: noise pollution and leaching chemicals into your soil.

By having a heavily insulated building, you may avoid much of your shop’s potential noise pollution. Ensure that your neighbors, human or animal, do not have to endure the constant noise of your power tools, fans, or other loud machinery. Noise pollution is still pollution, and you can adversely affect nearby habitats.

Ensure that any harmful solvents, paints, and other waste that your shop produces is not allowed to be exposed to the environment. If you are using conventional toxic paint, turpentine, or wood stain, avoid putting anything down the drain. If you wash your brushes, use a common bucket

and dispose of the water in a safe way that ensures that your chemicals don't enter a local stream, reservoir, or water table.

Storage & Disposal of Volatile Products

What about disposal of unused chemicals? Many volatile products cannot just be put in the conventional trash. Illegal dumping is not a practice your green business should be associated with, so keep in mind these tips:

1. **Know your products.** It's very helpful if you know which of your stains, varnishes, sprays, paints, and solvents are dangerous. If you are engaging in the practice of buying 'greener' products, like turpentine alternatives or non-toxic paint, make sure you follow their disposal instructions. If you're not sure, do not throw it in the Dumpster. Ensure that your employees are also educated about consulting product labels for disposal procedures.
2. **Designate an area for volatile chemicals, both unopened and used.** Storing unhealthy products separately is a good idea, especially if you are trying to avoid soil leaching. Make sure the area has a thick concrete pad floor, and is sealed well. Store partially used cans in this area as well, to keep until you have an opportunity to dispose of them safely.
3. **Check out local dumping days.** Once you have a substantial stash accumulated, you will want to dispose of them in bulk. Many communities have days of the year in which they designate a gathering place for people to get rid of old paint, dead computers, and other dangerous products all in one trip. Check your local listings so you can plan for your disposal day. Some accumulation of hazardous waste may require your business to hire a subcontractor.

Shipping: A 'Green' Approach

Packing and shipping can be a difficult capability to introduce, particularly if the products produced are heavy, delicate, or subjected to long shipments with third-party providers. Types of packing and shipment methods are dependent on the business model. Does the business:

- ❑ Ship directly to its customers (a business-consumer model)
- ❑ Ship in bulk to selected wholesalers or retailers?
- ❑ Ship in bulk to a third-party logistics operation or warehouse, who further delivers goods to customers (an example would be warehousing goods at Amazon.com)?

- ❑ Require tracking of its goods with timely updates to the recipient?
- ❑ Have bulky items that must ship in partial or full freight loads?
- ❑ Ship locally only?
- ❑ Have export compliance requirements?

If a company has products which are shipped, it must work diligently to develop packaging that prevents breakage in transit. This can be trickier than it sounds, since packages in transit are subjected to a lot of movement and impacts. The method of shipment is affected by weight, special needs (refrigeration for example), shipping volume, and the girth of the boxes. For example, companies shipping light-weight items direct to consumer often use the Post Office, because it is most cost-effective. Companies shipping larger boxes direct to consumer typically use UPS or FedEx because these companies handle shipment volumes under a “partial freight load”, and provide tracking information which is demanded by consumers. Manufacturers distributing through wholesalers or third-party distributors may start by trucking their own goods, or may pay for delivery services from trucking companies.

Home Décor Business A remarks: “I regularly spend over \$10 in packing materials for my larger pet and baby gates that ship nationwide. That doesn’t sound like much, except that the gates themselves sell for well under \$200. As a result, my business buys boxes and materials in bulk from packing vendors such as Uline, in order to get costs down as low as possible.”

The biggest challenge is in managing both reliability and cost of shipping services. Costs can mount quickly. And, if you concentrate your services through a major provider, such as UPS, you can receive significant discounts. Another problem with small businesses is in controlling the cost of packing materials. For the SBO aiming to be as green as possible, this may present an even higher cost. Here are some ideas for green shipping practices:

- **Combine forces.** By using a local packing/shipping center, you can take advantage of a common facility space, make use of shared services like foam molds, and participate in bulk discounts on boxes. Creating a neighborhood center for packing could generate jobs as well as allow small businesses to participate in a sort of co-op setting by paying through an up-front fee or pay-as-you go model.
- **Recycle.** Packing products involves a lot of filler, and using brand-new peanuts or foam is not necessary. Your own home’s

waste is an opportunity: reuse your daily newspaper, your scratch paper, or your rejected printer jobs as cushioning for your small products. Your neighborhood is also full of unused refuse. Many businesses like grocery stores give away the cardboard boxes food arrives in, and local businesses may get rid of their newspapers at the end of the day. Taking advantage of unused waste paper is a great way to cut down on your shipping carbon footprint.

- **Purchase recycled shipping products.** Some larger products may not be able to be shipped using only recycling from your neighborhood. In this case, you can turn to the blossoming market of recycled shipping materials. For example, **CareMail** makes recycled paper ‘bubble wrap’, recycled paper padded envelopes filled with shredded newspaper, recycled cardboard boxes, and biodegradable packing peanuts. Available at Staples, the company also makes larger shipping boxes as well.

Recycling & Composting

There is no reason your business should have to throw away every piece of waste it produces; reduce your contribution to our nation’s landfills and better your environment. Much of the waste your workshop produces can be recycled or composted, one of which you can take care of on site.

- **Cardboard:** Every aspect of the supply chain in your business will most likely have packaging waste, a lot of which is cardboard. You can recycle cardboard boxes and use them again for your shipping needs, or you can also break down your accumulated mass of boxes and give them to a recycling center.
- **Food:** You and your employees will be producing food waste at work, and if you have a small amount of outdoor space, you can establish a compost pile. Eggshells, pizza crusts, fruit peelings, old leftovers, and coffee grounds are just a few examples of food waste that can be composted rather than thrown away. Compost heaps give back nutrients to your local flora, and can be used as fertilizer after fermenting for a period of time.
- **Organic Waste:** If your shop utilizes wood products in any part of its production line, you will inevitably end up with sawdust and unusable wood scraps. Toss these on top of the compost heap as well, there’s no need to inject organic waste into a landfill that will decompose on its own in your compost pile.
- **Plastic:** Plastic takes thousands of years to decompose, so putting it in a compost heap or a landfill is a waste. Recycle

plastic products instead to give them a second life and keep them from harming the environment. Bottles, bags, and packaging materials can all be recycled at your local recycling center.

- **Glass:** Glass containers are less common nowadays, but they can also be recycled by you or by a recycling center. Use them as storage containers for brushes, fasteners, or other odds and ends. Bring them to your recycling center to ensure they get used again.

Cost Analysis:

The hard numbers for why you should abandon conventional building methods

I could write a book twice as long as this one extolling the virtues of green building, but it would not convey the benefits, especially financially, of environmental design as well as a quick cost analysis can.

The real proof of how effective a green building component can be is its projected **payback period**: how long it takes that component to break even. Traditional building components are usually cheaper than environmentally friendly ones, so the payback period tells you how long it would take for the lower power use or loss, higher R-value, or higher thermal efficiency of the green product to pay off the higher initial cost. In this section I have analyzed the payback periods for light bulbs, windows, and thermal insulation.

Some products, such as wind turbines, photovoltaic cells, and high-performance windows have very long payback periods. As the technology becomes more mainstream and prices go down, those payback periods will also be reduced. The main question to ask yourself when looking at these larger investments is: “Will the life of my building or company be longer than the payback period for this product?” If the payback period is long, but your building will stay in your family for three more generations, then the investment is worth it.

Crunching the Numbers

If the previous sections didn't already convince you of the value of green building and retrofitting, hopefully this cost analysis will give you the

numbers to really see the contrast between conventional building and green improvements.

Each system will be inspected, giving the upfront costs for conventional construction versus green, the payback period for the green alternative, and the contrast in efficiencies, power production, and heat losses. Environmental impact will be compared as well, as both an ethical cost and a monetary one. All upfront costs are calculated using pricing on Amazon.com or Home Depot. Hopefully this will illuminate the pros to green building for any skeptics out there, and will affirm the assertions of green building enthusiasts everywhere.

Comparing Components

Light bulbs: A conventional 40-W incandescent light bulb can be bought for as low as \$0.50, but has a lifespan of only 2000 hours and 90% of its power use gets converted to heat production rather than light. A 20-W compact fluorescent bulb (CFL) on the other hand, costs around \$5.25¹, produces the light equivalent to a 60-W incandescent, has a lifespan of 10,000 hours, and converts only 30% of its power use to heat production. If the contrasting bulbs are used for 4 hours a day and it is assumed that the average shop will have around 15 light bulbs, the data shows²:

Incandescent bulb:

Power use/year	\$ loss/unit/year	Total \$ loss/year
109.5 kWh	\$8.10/bulb/year	\$121.50/year

CFL:

Power use/year	\$ loss/unit/year	Total \$ loss/year
29.2 kWh	\$0.72/bulb/year	\$10.80/year

¹ Note: CFLs can be found for as little as \$0.99 on sale at hardware stores.

² Annual power use was calculated by multiplying wattage (J/s) by amount of time the bulb was used per day, every day for one year (4 hours x 365 days = 5256000 seconds). Amount of power used that was lost to heat was calculated by using the heat production statistics, calculating their portion of the power use, and calculating the monetary value of that loss using the energy price of \$0.0822 dollars per kWh. This was then multiplied by 365 to achieve the statistic of monetary loss per annum. The savings of the green bulb was calculated by subtracting the annual monetary loss of the CFL from the annual monetary loss of the incandescent. The payback period was calculated by taking the price of one CFL bulb divided by the difference between the daily power use of the two bulbs multiplied by the energy price. This gave a payback period in terms of days.

\$ Savings/year
\$110.70/year

Payback period
290 days

Insulation: By following the building code’s bare minimum of R-13 insulation, you will pay around \$4.41/m², incurring a heat loss of around 0.769 W/m². By choosing to go with a higher value of R-40 for your walls, you will pay around \$14.53/m², incurring a much lower heat loss of 0.25 W/m². Assuming a temperature difference of 10 °C³ and an average wall area of 100 meters for your shop, the data shows⁴:

R-13:

\$ loss/component/year	Total \$ loss/year
\$1.11/m ² /year	\$111.00/year

R-40:

\$ loss/unit/year	Total \$ loss/year	\$ Savings/year
\$0.36/m ² /year	\$36.00/year	\$75.00/year

Payback period
3.2 years

The thicker the insulation, the quicker the payback period will be, as the heat loss statistics will be lowered even further.

Windows: Especially if you are retrofitting a space, you may have a space outfitted with outdated window technology. If you are using an old barn or a mother-in-law apartment built several decades ago, you may even

³ To clarify, this is the temperature difference between your ambient shop temperature (20 °C) and a hot summer (30 °C) or cold winter (10 °C) day.

⁴Heat loss per area was calculated by taking the temperature difference and dividing it by the R value. Monetary values were then calculated by multiplying the heat loss data by 365 days per year and the energy price of \$0.0822 per kWh. Total monetary loss per year was calculated by multiplying the previous data by the shop’s thermal area, which was assumed to 100 m². The savings of the R-40 insulation was found by subtracting its monetary loss from the R-13’s monetary loss. The payback period was then found by taking the price of one square meter of R-40 insulation divided by the difference between heat loss between the two insulations multiplied by the energy price. This was done on a per annum basis, and therefore gave a payback period in terms of years.

have single-pane windows in your space. This portion of the cost analysis will serve to illuminate the many reasons you should replace outdated windows with newer, multiple-paned windows. An old single-paned window with a U-factor of 6.25 W/K m² (or 1.1 Btu/(h ·ft² ·°F) for those using the English system) will cost you pretty much nothing nowadays; people sell them on **Ebay** for \$15 or less. If you already have them installed in an existing space, the upfront cost is zero to you. But, with that low upfront cost comes large 'loss' costs down the line. Single pane windows lose 22 W/m², while a newer, high-tech Superwindow with a U factor of 0.8 (0.15 English) loses only 6 W/m². High-performing are comparatively expensive, running from \$200-300 per square foot. A middle-ground investment in double-paned windows with a U factor of 2.84 (.5 English), priced at around \$65-150 per square foot, may be a better bet, due to a lower payback period. Despite this higher upfront cost, investing in high-performance windows pays off, as the data shows⁵. The temperature difference is yet again assumed to be 10 °C, while the glazing area of the shop is assumed to be around 20 m²:

Single-pane window:

\$ loss/unit/year	Total \$ loss/year
\$10.95/m ² /year	\$219.00/year

Double-pane window:

\$ loss/unit/year	Total \$ loss/year
\$4.97/m ² /year	\$99.51/year

Payback period (single to double)
33.6 years

High-performance Superwindow:

\$ loss/unit/year	Total \$ loss/year	\$ Savings/year
\$1.40/m ² /year	\$28.03/year	\$71.48-190.00

⁵ Monetary loss per annum was calculated by multiplying the U-value of the windows by the hours spent heating with a temperature deviation of 10 °C or more from ambient indoor temperature, multiplied by the energy price of \$0.04 per kWh for heating by natural gas. The temperature deviation for a temperate climate would be about 4380 hours spent heating, while a colder climate such as Laramie has a total of closer to 9500. Energy prices may also differ, resulting in a higher or lower payback period.

Payback period (single to super)	Payback period (double to super)
37.8 years	100 years

As the data shows, it is most cost effective to improve from single-pane windows to any other sort of window (be it double-glazed or Superwindow), but the move from double to Super is less cost effective, with a pretty large payback period of 100 years. One thing to consider additionally is the added bonus of buying in bulk; many window suppliers make discounts for people with large orders, so shop around and you may find that your payback period diminishes to a more reasonable amount of time. Also, buildings in colder climates will have shorter payback periods; Laramie's payback period for a Superwindow will be about half of the totals above due to its frigid weather for nearly 8 months of the year.

Lastly, buying an assemblage of high-performance windows for an entire house can be a big investment, but the small scale of your shop makes purchasing green improvements much more financially feasible.

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Gretchen Heberling is a rising Junior pursuing a degree in Architectural Engineering, as well as a minor in Violin Performance. A native Washingtonian, Gretchen migrated to Wyoming for her undergraduate degree and plans on completing graduate school in Chicago or Boston. Inspired by the documentary series, *Design e2*, books such as *Cradle to Cradle* and *Natural Capitalism*, and blogs such as the *BLDG-BLOG*, Gretchen hopes to pursue a career in green architecture. This book's purpose is to show that small business owners can pave the way for environmental sustainability through small-scale projects in their own shops and warehouses; green building is not just for the big or the rich.

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