

New Product Adoption in Housing

Guidance for Manufacturers

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This pamphlet was prepared by Newport Partners LLC. Newport Partners provides analytical, technical, regulatory, and market research services to both public and private sector clients in the building industry.

Disclaimer

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Overview

The residential home building industry is a dynamic and leading indicator of the U.S. economy. Unfortunately, it has not shared the productivity gains experienced by other industries, in part due to a lack of innovation. Government studies and university research indicate that the very structure of the housing industry is an impediment to innovation. To help counter this trend, the Partnership for Advancing Technology in Housing (PATH) has funded several studies to better understand the process of innovation in housing. PATH recognizes that innovation is important to the housing industry in making homes more affordable, durable and energy efficient. This pamphlet is designed to assist manufacturers in transferring new innovations into the home building industry. Containing lessons learned through interviews, focus groups, and case studies, this guide takes an inside look at today's home building industry and provides tips for manufacturers looking to commercialize an innovation.

Gross Domestic Product	9,872.9
Gross Private Domestic Investment	1,767.5
Fixed Investment	1,718.1
Nonres Fixed Investment	1,293.1
Nonres Structures	313.6
Nonres Equipment & Software	979.5
Residential Investment	425.1
Share of GDP	4.3%
Share of Gross Private Domestic Investment	24.1%
Residential Structures	415.6
New	363.4
New Housing Units	259.6
Permanent Site	248.8
Single-family Structures	220.7
Multifamily Structures	28.1
Manufactured Homes	10.9
Improvements	102.4
Other	1.4
Brokers' Commissions on Sale of Structures	55.4
Net Purchases of Used Structures	-3.2
Residential Equipment	9.4
Personal Consumption Expenditures	6,728.4
Durable Goods	819.6
Nondurable Goods	1,989.6
Services	3,919.2
Housing Services	958.8
Share of GDP	9.7%
Share of Personal Consumption Expenditures	14.3%
Owner-occupied Nonfarm – Imputed Space Rent	702.7
Tenant-occupied Nonfarm – Rent	209.3
Rental Value of Farm Dwellings	7.7
Other Housing Services	39.1
Residential Investment + Housing Services	1,383.9
Share of GDP	14.0%

Source: U.S. Dept. of Commerce, Bureau of Economic Analysis

Table 1.
Housing Components in GDP – 2000
(billions of current dollars)

An Industry Overview

The home building industry represents a unique market opportunity for researchers as the housing market represents one of the most significant market segments of the economy. In 2000 the combination of private investment and consumption spending on housing represented 14% of GDP. In spite of the current correction in the housing market, the long-term outlook for housing is strong. There are interesting trends in consolidation that have the top 10 publicly traded builders taking an increasing large share of the market. However, the industry is still dominated by small and medium sized builders with in-depth knowledge of their individual markets and a focus on small metro and rural areas. Materials, labor, and building practices differ according to geography; type of construction (multi-family, townhouse or single family); new construction or remodel; local building code; factory-built, modular, or site-built; production, semi-custom, or custom; and builder size. The National Association of Home Builders Economics Department made the following interesting observations on trends in the current housing market:

- ⊙ Although consolidation will continue at the very top, the market share of the next tier (No. 21 to 100) isn't growing.
- ⊙ Small and medium volume builders will continue to dominate smaller metro and rural areas.
- ⊙ In larger markets, smaller builders will concentrate on "niche markets."
- ⊙ The overall market will continue to include a very large number of small companies.¹

¹ Source: NAHB presentation at the 2007 International Builder Show.

The Innovation Process

The federal government has studied reasons why housing is slow to adopt innovation. One such study, *Building Better Homes: Government Strategies for Promoting Innovation in Housing* authored by the Rand Corporation developed a new housing-specific model of innovation showing the complex process to commercialization (see Figure 1).²

This model is useful in that it indicates the repetitive nature of the process with the need for multiple interactions and feedback. This clearly has resource implications, both time and money, for bringing a new product to market. Be aware that commercializing a new product is rarely straightforward, and the "home runs" are few and far between. Most successful innovations have been carefully thought through and nurtured throughout the process.

Although the commercialization process can be long and expensive, research has shown that money alone is not a good measure of an innovation's likelihood of success.

"Hardworking R&D teams invest time and money in the wrong projects; manufacturing, marketing, and sales drop the ball on winning products and services, and senior executives and policymakers simply throw more money at research and development in the mistaken belief that it will make a difference."³

² Rand Corporation, *Building Better Homes: Government Strategies for Promoting Innovation in Housing*, 2003.

³ Booz Allen Hamilton, *Global Innovation 1000*, 2005.

New Product Adoption in Housing

Innovation is fundamental to a company's competitive advantage but it is a company's process of commercialization that correlates with success, not the amount of money spent.

Collaboration across functional areas (research, manufacturing, marketing, sales and service) is key, and the absence of collaboration can lead to failure.

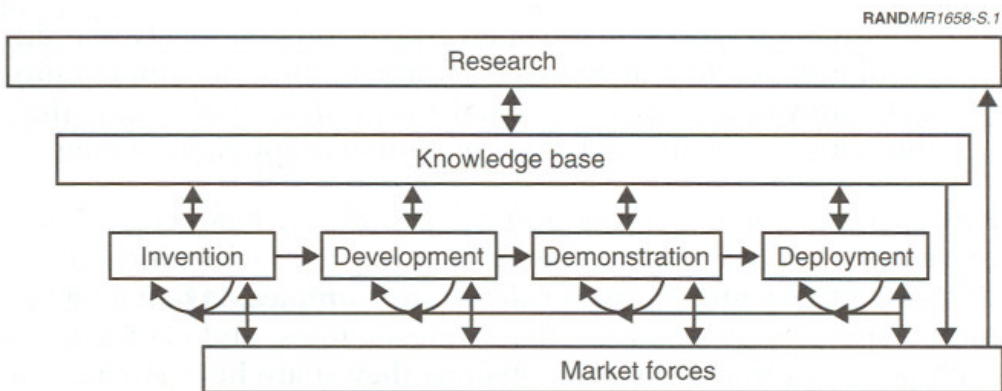


Figure 1.
Model of the Innovation Process

Understanding Your Target Market

In the multi-faceted home building market, assessing an innovation's chance of success can be a challenging task. Even a task as simple as identifying the customer can be challenging! Options include manufacturers, home owners, contractors, builders, or architects – any one of which may specify construction products depending on the individual application. Most innovations will enter the market through a specific sector within the home building industry – a market niche. Identifying the specific target for your innovation's market entry is a key to success. Case studies of industry innovations have demonstrated that understanding and addressing the demands and concerns of the target customer early on in the design phase are critical to timely and successful product design and development.

Whether the innovation has been developed in-house or you are licensing from a patent holder, defining your target market is critical. Before embarking on an invention/innovation purchase or proceeding to launch, do your homework. Market studies or focus groups composed of participants who will interface with your innovation can be an invaluable source of information. Key topics to consider include industry norms (what's used now?), price point (what does current technology cost, and at what price would the innovation be accepted?), constructability of the innovation (tools, time, learning curve), durability (shipping, construction, and lifetime performance phases), interfacing with trades (e.g. a wall system must interface with

electricians, plumbers, siding installers, insulators, and framers), and perceptions (regulatory/code officials, home owners, trades, home builders). Conducting a thorough market analysis can help avoid costly mistakes or prolonged time to market that can result from not understanding how the innovation interfaces with all parties involved in the building process. The value of identifying and addressing customer feedback early on in the design phase cannot be overemphasized. Note that it is a good idea to pursue innovation protection through a provisional application for patent and non-disclosure agreements before revealing too much through focus groups or other market research.

Avoiding Pitfalls

Both large and small manufacturers often have trouble successfully commercializing an innovation in the housing market. Some primary reasons innovations fail include:

- ⦿ Attempting to transfer an innovation from commercial construction to residential without a clear understanding of the substantial market differences
- ⦿ Lack of compatibility of the innovation with the overall systems being used in home building construction
- ⦿ Inadequate skills within the labor force
- ⦿ Inadequate supervision with product introduction leading to installation problems and frustration

To be successful, developers need to receive a rate of return high enough to recoup the cost of investment quickly. Negative rates of return may be acceptable for a short period of time so as to gain a first-to-market advantage.

The International Code family has over a dozen codes that may apply to a jurisdiction depending on local adoptions. The International Residential Code (applicable to detached one-and two-family dwellings and townhomes up to three stories in height) and the International Building Code (applicable to all other new construction), are the general codes pertinent to the residential building industry. Code approval is the first step towards market acceptance of an innovation, but the battle for regulatory approval doesn't always end there. For example, air admittance valves (AAV), innovative plumbing system components that eliminate the need for a vent pipe and roof penetration, are approved within the 2003 IRC. However, these valves have a history of code official opposition at the local level, where jurisdictions sometimes prohibit them due to lack of product familiarity.

If your innovation does not meet code approval in its current state, consider design refinements that will result in compliance, or propose code changes to the relevant I-Code. For breakthrough innovations, the ICC Evaluation Service provides a process by which manufacturers can submit testing data that will allow for the development of a technical report which becomes a public document. The ICC Evaluation reports can then be used by manufacturers as evidence that their product meets code and regulatory requirements. From start to finish, an evaluation report can take 18-24

months. Code changes can take equally long or longer time frames. Both processes can be time and resource intensive and can severely constrict an innovation's chance for success. The code requirements and processes need to be understood early on. As dull as they are to read, codes are a living organism – under constant revision and maintenance. By paying close attention to codes and other regulatory requirements you are less likely to have unexpected delays or resistance in a product launch.

Building codes define the minimum building practices and systems. Despite defining a minimum practice, products and systems that just meet code continue to account for the majority of product installations in homes. Thus, if your product is beyond code, it must bring an enhanced value such as productivity improvements or added functionality. Productivity improvements are those that decrease the cost of inputs, or increase cost effectiveness through reduction in labor or time. Functionality improvements generally are those that increase livability, comfort, health, or provide increased durability. Recognizing where your product fits is key to market positioning. Some products may result in productivity improvements as well as functionality improvements, such as Lightning Switch described below. This case study also highlights the importance of understanding building codes.

Case Study:

Meeting Multiple Market Drivers

Technology Summary

The Lightning Switch® (the “system”) is a versatile technology that can be used on pretty much anything you want to turn on/off. Based on NASA space technology developed at the Langley Research Center in Hampton, Virginia, the patented Lightning Switch® combines the function of conventional wired switches with the flexibility and convenience of wireless remote controls. It holds tremendous potential for making retrofit projects much quicker, more cost effective, and less disruptive to the building occupants. In terms of new construction, the benefits include eliminating wiring, removing the shock hazard that a normal hard-wired switch poses, and providing great versatility in configuring 3-way and 4-way switch setups, or any other configuration that the user could need.



The Lightning Switch® permanently controls lights and appliances without the installation of any new wires. For re-wiring projects, labor savings alone (compared to conventional rewiring) can amount to \$200 or more per switch. Receivers can also be plugged into outlets, and the light fixture or other device is then plugged into the receiver. This allows the user to change switch configurations to their outlets, without having to rewire.

Current Stage of Development

The technology has been commercialized and the product has new distributors. There continue to be code issues with the use of the product which need to be resolved and emphasize the importance of paying attention to codes. For example, there have been issues as to whether a wireless switch satisfies the code requirement for a switched outlet or fixture in each room in a dwelling. Section 210.52 of the NEC requires 1 switchable outlet or fixture per room. With non-wired switches and plug-in receptacles which communicate with these switches, there is a concern that this wireless system might not be permanent, and a room would not have the required switchable outlet or fixture in the future, thereby creating a safety hazard. A key point in this issue is the definition of a “switch.” The National Electric Code (NEC) does not define a “switch” in a way that would exclude the Lightning

Switch®. However, it has been interpreted that a “switch” basically means a traditional hard-wired switch – which is the position stated by some electrical inspectors. In every code, local inspectors have the final say.

Partnerships

Lightning Switch® takes good advantage of partnership opportunities. It has a strong relationship with a manufacturing partner in Taiwan. They also use UPS Trade Direct to ship their products from the manufacturer in Taiwan to the distributor in the US. Lightning Switch® hopes to achieve their goal of a 1-2 day shipping time to the distributor by using UPS Trade Direct and the UPS domestic delivery system. They also have identified target markets in Western Europe, South Africa, as well as Argentina, Chile, and Uruguay. Lightning Switch® plans to use UPS Trade Direct to ship products to these target markets as well. This partnership with UPS will help them reach a wider international market, in addition to allowing them to use their manufacturer in Taiwan, while still maintaining a fast supply chain to their distributors.

Another possible group of partners is electronics manufacturers. Lightning Switch® is examining the possibility of installing receivers in products such as lighting fixtures or other electronics. This would allow consumers to buy products that are already set up to

work with the system and that require no further product installation. Lightning Switch® is also exploring partnerships to integrate their product with a variety of systems applications such as HVAC, plumbing, and security systems.

Lessons Learned

There is more of a marked benefit in commercial building and housing retrofits than in new residential buildings. However, this may change if the company achieves a more ubiquitous integration into other products such as lighting fixtures and mechanical systems. Also, as mentioned above, there may be local code issues to overcome, but the versatility of the technology makes changing to fit code much easier than a less flexible innovation.

Conclusion

Lightning Switch® is an award winning (winner of the 2006 International NOVA Award), innovative technology that changes the way we think about building renovation, electrical wiring methods, and wireless controls of electronic devices. It addresses both the key drivers of efficiency and functionality. The company has done its research in identifying markets. The product has been well received and the company is likely to find multiple additional applications in the future.



Look for Market Opportunities

Understanding what is happening in the housing market can help you focus on key opportunities. For example, many industry experts believe that a down cycle is the best time to introduce a new product.

The best time to advance innovation is during a housing recession when builders are looking for something to make their product distinctive. When the housing market is booming, builders are likely to be resistant to innovations that might slow down their standardized processes. To be successful, innovations must be sensitive to market timing.

PATH Report on Overcoming Barriers to Innovation, April 2005

If your innovation includes environmental features, look at “Code-plus” programs as a strategy for marketing your innovation. These programs often focus on energy efficiency, durability, indoor air quality, or “green building” – the practice of environmentally responsible and sustainable building. Most current green building programs, such as LEED for Homes and NAHB’s Green Home Building Guidelines, award points to different products and systems based on their perceived environmental impact. At the heart of most green building programs is the EPA’s Energy Star qualification. Affordable innovations that assist builders in meeting these programs’ objectives stand to capitalize on one of today’s fastest growing segments of home building – the green building market. A recent survey has found that the primary reason home buyers would be motivated to purchase a green home is the knowledge of the health benefits associated with these homes, pointing to market demand for greener, healthier products.⁴

⁴ Robert Charles Lesser & Co. (July 17, 2007). Building Green TV and RCLCO Reveal that Health is the Most Powerful Motivator for Consumers to Build or Buy a Green Home. Retrieved Aug 5, 2007 from http://www.rclco.com/pdf/Jul172007521_Press_Release_RCLCO_and_Building_Green_TV.pdf.

Market Timing: Sometimes you just need to wait!

Infinia, a small company based in Washington State, developed a long life Stirling engine for applications in the space industry. In a textbook case of tech transfer, Infinia has partnered with a Japanese firm to integrate their engine into a residential micro combined heat and power unit (CHP) that can function as a mini-power plant for the home – providing space heating, water heating, and electricity. Infinia’s engine is energy efficient, has low maintenance needs, operates quietly, and has the potential to serve as backup power during grid failures. Micro CHP units are finding great success in Japan and Europe where regulatory incentives and a favorable natural gas to electricity price ratio are driving the market.

Communicating Product Features

Give thought to how to quantify and communicate the lifecycle cost and benefit of your innovation. If energy prices continue to climb with increasing global demand and more restrictive environmental regulations, the door for home energy-conserving innovations will continue to widen. Gas, electric, and water utility rates and regulation may have a make-or-break effect on your innovation, so pay close attention to these as you look for market entry points. Though limited in duration, utility and government tax incentives and subsidies can sometimes provide sufficient opportunity to bring an innovation to market. Understanding and communicating how your innovation fits into this market are critical to selling the innovation.

The Commercialization Timeline

One common mistake made by manufacturers is underestimating the time required to commercialize a new product. At a roundtable discussion held at the 2007 International Builders Show in Orlando, Florida, with various housing industry related manufacturers and innovators, discussants agreed that commercializing a new technology takes 5-6 years when everything goes as planned. Even with “home run” innovations (innovations expected to be profitable very quickly) the minimum time required to introduce a new technology to market is 3 years. Although these guidelines are fairly consistent and repeatable rules of thumb, individual experiences can vary significantly based on the following:

- ⊙ the complexity of the product being commercialized,
- ⊙ the source or ownership of the innovation,
- ⊙ the qualifications and testing required, and
- ⊙ the market’s readiness to accept the new product.

For example, Leviton, a leading North American innovator and producer of electronic products is often able to bring products from concept to production in 6 months, while the Lawrence Berkeley National Laboratory’s Environmental Tech Division (LBL) has been working on research, development and commercialization of its innovative product, the Integrated Window and Wall System (IWWS), for over 14 years. In this instance, the disparity in the length of the commercialization process can largely be attributed to two factors: the Leviton innovations are often line extensions of previously commercialized products within previously commercialized systems, while the LBL IWWS is an innovative new concept requiring modifications to building processes; and, manufacturer innovations are motivated by competitive forces and a return on investment whereas a government laboratory research innovation serves a public purpose or research purpose and may not be driven by profit or schedule.

It is important to fully evaluate your market research and analysis to most accurately predict the length of time required for commercialization of your specific product. The chart below represents an approximate breakdown of how some companies view the innovation cycle.⁵

5 PATH 5 Business Unit Case Studies, p.10.

	Approximate Costs
1. Business Unit “D” Product Development Process	(%)
Exploratory Phase	
Gate 1: initial idea screening	
Stage 1: objectives definition and idea assessment	5%
Gate 2: feasibility review	
Stage 2: detailed project investigation	15%
Development Phase	
Gate 3: project authorization	
Stage 3: development	60%
Gate 4: development review	
Stage 4: validation and testing	10%
Industrialization Phase	
Gate 5: launch approval	
Stage 5: product launch	10%
Post Launch Review	

**Table 2.
View of the Innovation Cycle**

Developing Partnerships

Some companies license technology or create partnerships with researchers or inventors rather than, or in addition to, inventing in-house. Manufacturers employ several approaches for gathering innovations or inventions including partnering with universities which we explain in more detail below. Methods for acquiring innovations from external sources include:

- ⊙ International companies with similar businesses may have innovations they are interested in licensing to gather market share;
- ⊙ International companies with aligned products but not direct competitive products may license the use of their technology;
- ⊙ Companies with a particular need for innovation in a certain product area may actually put out a request for procurement, either directly or through a third party;
- ⊙ The Federal Government can be a source of technology. For example, NASA developed technologies are available for licensing. NASA created the Innovative Partnerships Program (IPP) to assist companies interested in commercializing NASA technologies. The IPP's goal is to leverage technology through investments and technology partnerships with industry, academia, government agencies, and national laboratories;
- ⊙ College and university Technology Transfer Offices often have a wealth of innovations and technological developments. It is the objective of these offices to further the commercialization of the schools' innovative technologies.

Issuing solicitations for research projects.

Some manufacturers are able to acquire innovations by soliciting for them from various established research firms. For example, Dow Chemical Company has had success in hiring NineSigma, an innovation sourcing company, to solicit proposals for various innovative technical methods to meet several specific technical needs.

Working with Colleges and Universities

Colleges and universities are a valuable source of innovative building-related technology and it is important to understand the schools' motivators and typical processes when considering commercializing one of their innovations. Most larger, research-oriented colleges and universities have created Technology Transfer Offices (TTO) tasked with the role of managing the relationship between the schools' innovators and commercial industry. These offices are faced with the interesting challenge of furthering various objectives including promoting the schools' critical missions of education, research and service while pursuing maximum financial return for both the university and the product's creator. TTO's have many different customers with often conflicting objectives. TTO customers include faculty, university administration, governing boards, taxpayers and private businesses. The TTO will

usually represent the university's innovators from the time that the innovator begins to consider commercialization of the innovation until the time that the technology is licensed to a third-party developer or developed by a newly created start-up organization.

Once the decision is made to solicit interest in commercialization from a third party developer a non-confidential summary is sent to companies that are likely to be interested. Usually, this is a one page brochure about the innovation. If a company expresses interest, they will be asked to sign a secrecy agreement to protect patent rights prior to the receipt of any confidential information from the university. If the company remains interested after reviewing the confidential information, an agreement with the company is negotiated. This can be a letter of intent, an option, or a license. In conjunction with any one of these alternatives, a research agreement may be negotiated to continue to work on the invention at the university. Most university inventions are embryonic and require further research and development before they are ready for the market place. Due to the limited development of many university innovations there is often a high level of risk in licensing the development of their innovations without a thorough evaluation of the technology's level of development. Be sure to fully evaluate the extent of research to date and consider the stage of development when negotiating the licensing agreement.

Common University and TTO Characteristics and Expectations

There are several characteristics and expectations that are typical of TTO staff and university innovators that are important to know when negotiating a potential commercialization partnership. TTO staff and university innovators often have unrealistic expectations of research opportunities, income, public utilization, and fame. University innovators have usually dedicated significant time and effort to the product and therefore have significant personal investment in the success of the product. It is important to keep this in perspective as you negotiate license terms in order to temper unrealistic expectations and avoid problems down the road.

Also, it is important to keep in mind that all universities are different. Some universities focus on regional economic development, some focus on academic renown, while still others gauge the success of their research programs by the number of patents granted and the extent of product penetration into the market. Universities that focus on regional economic development may not support an idea unless it holds promise for creating jobs regionally. Universities that focus primarily on their academic prominence are more likely to put more effort into the development of the product and the theories surrounding it than bringing the product to market. When working with these universities it is important to reassure the university that the commercialization of its technology will only further build the economic reputation of the university. Still other TTO's are measured on their success in obtaining patents and by how many

innovations are transferred to the market. Some common numerical measures include the number of patents filed, the number of license agreements executed and the success of new companies formed. Secondary numerical metrics include revenues from license fees, royalties and cash from equity investments paid to the academic institutions as well as the number of products successfully introduced to the market. It is essential to understand what type of university you are working with and to adjust your tactics to working with them accordingly.

Financial Resources

There are several federal and state programs that have funding available targeted for the support of innovations in the housing industry. Federal programs and processes can be easier to navigate and less restrictive than state programs. They are known to be more accessible and not as onerous and restrictive as the state grant programs, although state programs with significant funding are also available if you are willing to put in the extra work. Examples of state energy programs that offer grants are the New York State Energy Research and Development Authority (NYSERDA) and the California Energy Commission (CEC). Both can have high cost of entry (e.g. time, resources) and may have restrictions based on business size, ownership, and location. Some programs may require royalties to be paid as well. National level funding opportunities are available specifically for housing industry related innovations through the U.S. Department of Housing and Urban Development among other resources.

For small manufacturers, the government runs programs that can be very helpful in providing financial support for new technologies. The Small Business Innovation Research Program (SBIR) and the Small Business Technology Transfer Program (STTR) are government sponsored programs that encourage small businesses and researchers to explore their technological potential by providing incentives to research and develop new technologies. Funding from both the SBIR and STTR programs is available through various government agencies. Both the SBIR and the STTR are 3-phase programs structured as follows:

- ⦿ Phase I: the startup phase. In this phase small businesses are eligible for awards of up to \$100,000 for approximately 6 months of exploration of the scientific and technical merit or feasibility of an idea or technology.
- ⦿ Phase II: R&D work. In this phase small businesses are eligible for awards of up to \$750,000, for use over as many as 2 years with the intent of expanding the results of Phase I. During this time, the R&D work is performed by the researcher and he or she will evaluate the potential opportunities for commercialization of the technology.
- ⦿ Phase III: technology to market: In this phase the Phase II innovation moves from the laboratory into the marketplace. Unfortunately, there are no SBIR or STTR funds available to support this phase. The small businesses and researchers must find funding in the private sector or other non-SBIR/STTR federal agency funding.

To be eligible for funding under the SBIR program you must be an American-owned and independently operated, for-profit business with fewer than 500 employees, and your principal researcher must be employed by the business. To be eligible for funding under the STTR program you must be a small business meeting all the requirements of the SBIR program or a qualified non-profit research institution. Although there is no size limit for non-profit research institutions, to be eligible non-profit research institutions must be located in the U.S., be a non-profit college or university, a domestic non-profit research organization or a federally funded research and development center.

In terms of housing-related innovation the Department of Energy (DOE) is probably the most active user of SBIR grants. Each year DOE issues an invitation to small businesses to apply for SBIR Phase 1 grants.

PowerLight Corporation – An example of an SBIR DOE success!

PowerLight created a roofing tile system that significantly reduces roof deck temperatures through passive means. The product can also integrate photovoltaic cells to produce electricity. This innovation offers building owners two ways of lowering energy costs, one by generating environmentally friendly solar energy for the building, and another by reducing the air conditioning load. For more info on this product go to <http://www.powerlight.com>.

One of the attractions of the SBIR program is that the government does not look to share in any royalties or require a payback on its investment. The program recognizes that small businesses and entrepreneurs are substantial sources of innovation. In a study in 1982, it was found that small businesses had 2.5 as many innovations as large ones. The program seeks to provide enough capital to allow small businesses and entrepreneurs to compete on the same level as their larger counterparts.

Another government program available to support the commercialization of technology is the Advanced Technology Program (ATP) administered by the National Institute of Standards and Technology (NIST). The ATP provides help for companies in financing their projects in order to help bolster industry and bring about new technologies. The ATP bridges the gap between the research lab and the market place. Through their relationship with private sectors, ATP provides a springboard for new technologies by providing funding for research and development that is likely to benefit industry yet would be unlikely to be funded by commercial industry due to high competitive pressures. Because technologies change so fast, many companies are forced to make short term decisions to keep up with the pace of the market. The ATP focuses on a broader perspective attempting to uncover projects that will benefit the entire nation for the long term.

There are certain things that set apart the ATP from other government based research and development programs. The ATP sets its research priorities by American industrial needs not the needs of the government. There are strict cost-sharing rules involved with the ATP as well. Joint Ventures must pay at least 50 percent of the cost,

while larger, Fortune-500 companies must pay at least 60 percent. Small and medium sized companies working with the ATP must pay a minimum of all indirect costs to the project. Also, the ATP doesn't fund product development. The costs of all development are on the company.

Title to any inventions arising from an ATP-funded project is required to be held by a for-profit company, or group of companies, incorporated or organized in the United States. Although universities, government laboratories, independent research organizations, and other nonprofit organizations cannot retain title to patents, they are able to receive payments from the company or companies holding title to the patent. Title to any inventions created under ATP funds cannot be transferred or passed, except to a company organized in the United States, until the expiration of the first patent obtained in connection with the invention.

Although there are significant funds available through government entities, researchers often need to seek outside sources of funding to complete the R&D and marketing necessary to result in development and ultimate commercialization of their technology. The level of information required by investors will vary according to their familiarity with the subject matter as well as their commitment of capital. As many researchers already know, funding is often available through colleges and universities.

Other Resources

Depending on the innovation, Table 3 below identifies some resources that provide economic data, market research, industry background, or consulting in the area of commercialization.

Organization	Industry Sector	Type of Resources Available	Website
Department of Housing and Urban Development	Federal Government Agency - Housing	Research on Innovation and Technology Transfer Annual Housing Survey	http://www.hud.gov/ http://www.pathnet.org
National Association of Home Builders (NAHB)	Industry Association	Economics Data on Housing Market	http://www.nahb.org/
Joint Center for Housing Studies	Academic	Economics and Industry Research	http://www.jchs.harvard.edu/
New York State Energy Research and Development Authority (NYSERDA)	State Government Agency - Energy	Research, Energy Efficiency	http://www.nyserda.com/
International Code Council	Building Codes	Building Codes Product Evaluation Service	http://www.iccsafe.org

**Table 3.
Resources for Further Information**

Reaching the Market

Housing innovations can fail to successfully reach the market for several reasons. Failure in the commercialization process is most often due to the fact that the innovation is not a good fit for the housing market or to an error in the implementation of the commercialization plan. Once you have done your homework and feel that the innovation offers productivity and/or functionality advantages, have ensured that the innovation is currently accepted by respective codes or you have a plan for code acceptance, you will still need to market the products to specific segments of the construction industry. It is important to identify and target the appropriate housing segment (single-family custom, multi-family townhouse, etc.) or geographic niche.

Much has been written on adoption of innovation generally and it tends to follow (with some variations in categorization, terms, etc.) the model put forth by Everett Rogers shown in Figure 3.⁶

With the strategy of focusing on innovators and early adopters, you need to identify specifically

⁶ Everett Rogers, *Diffusion of Innovations* (Fifth Edition ed.) 1995. New York.

who this group is for your product innovation. From within the home building industry generally, the types of home building firms most likely to be early adopters are:

- ⊙ Modular builders and multi-family builders
- ⊙ Single-family custom home builders
- ⊙ National and regional builders⁷

Further refinement is necessary based on your specific innovation. For example, if the innovation deals with a mold problem, you might focus on hot humid climates within the early adopter categories. If the innovation is a new panel system designed to save time in the field, the single-family custom builders and national and regional builders may make more sense, particularly in areas with labor problems.

After targeting the market segment you need to decide on a distribution strategy and develop an informed message that allows a builder to understand the innovation as well as the costs and benefits easily. These steps are often best accomplished through market research.

⁷ PATH Study, *The Diffusions of Innovation in the Residential Building Industry*, January 2004.

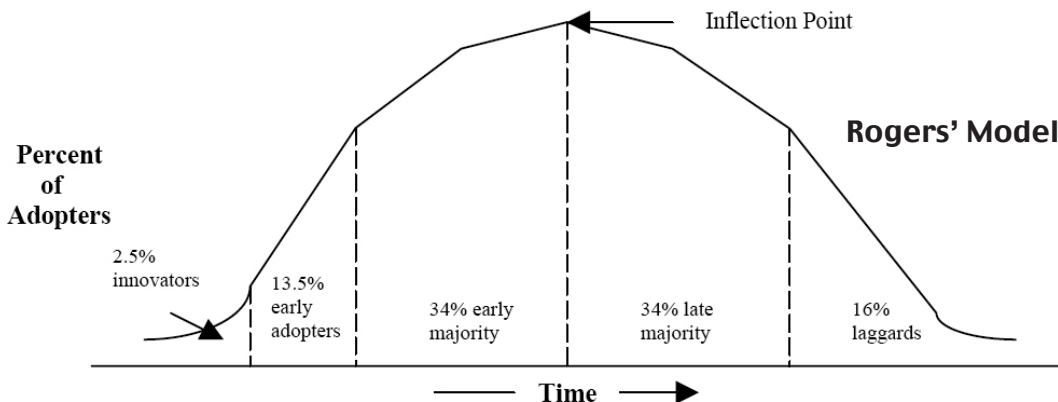


Figure 3.
Rogers' Model of Innovation Adoption

Conclusion: Five Steps to Increase Your Chances of Success

1. Do your homework on the housing market and identify where your product fits.
2. Identify the market driver. Does it meet a code requirement? Does it increase productivity? Add value through increased functionality?
3. Understand code implications. Does it conform to applicable codes? Will it need an evaluation report or code change for acceptance?
4. The process you employ in commercialization is more important than the spending. Make sure the entire team is onboard and that good collaboration takes place across functional areas.
5. Develop targeted messages specifically for your identified markets.

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The Partnership for Advancing Technology in Housing (PATH) is dedicated to accelerating the development and use of technologies that radically improve the quality, durability, energy efficiency, environmental performance, and affordability of America's housing.

PATH promotes innovation through three key strategies:

- Identify and reduce barriers that impede innovation, including regulatory barriers. PATH analyzes and prioritizes existing barriers to provide recommendations for overcoming them.
- Disseminate information to speed the development and adoption of advanced building technologies. To encourage broader diffusion of innovations, PATH provides unbiased, easily accessible information to consumers, builders and manufacturers.
- Advance housing technology research and foster development of new technology. PATH research focuses on the innovation process and aims to institutionalize sustained investments in housing with public and private funding.

