EARTHEN CONSTRUCTION, CAN IT GO EXPONENTIAL?

M. John Jordan

MBA/MOT, Paverde LLC, Albuquerque, New Mexico, USA
john.jordan@paverde.com

James C. Moore

PhD, NeoTerra LLC, Weslaco, Texas, USA
jim@neoterrabuilders.com

Introduction

Earthen construction has demonstrated its inherent benefits and challenges for millennia, and while the majority of the world utilizes earthen materials for dwelling construction, in the US this is not yet the case. It continues to have a small but passionate following, but it has not been able to cross the commercialization chasm that would lead to widespread adoption as an economically viable and consumer-accepted construction method. The reasons for this are numerous and widely variable, from raw material availability to construction code trials and tribulations to public perceptions of earthen dwellings. The benefits of earthen construction are numerous and demonstrable but to commercial developers, these benefits are of little business value due to the economic, marketing, and operational challenges presented by earthen material construction.

This paper will focus on examining the factors that have been roadblocks to earthen construction growth using the lens of technology development and commercialization practices and methodologies. We will evaluate these factors by employing specific business analysis tools normally and aggressively employed by high tech industries to successfully drive their new discoveries forward into new and/or evolving markets. We will demonstrate that dramatic, even exponential growth, is possible and even probable for the earthen construction industry by taking the approach that earthen products must be seen as a developing and emerging technology. The principal goal of this paper is to provide the audience with the information and insight necessary to understand, embrace, and ultimately employ the business strategies that will help achieve this.

Current situation

Earthen construction in the US has seen a far different outcome than in many parts of the world, particularly due to the emergence and dominance of mass produced “normal” construction materials such as dimensional lumber, concrete in various forms, and steel. While earthen materials have been used in the US for hundreds of years, the lag in keeping up with the production rate of these other

materials has proven to be one of the most problematic issues for widespread adoption of earthen construction. This lag is both caused by and extends into the issues of standardization, marketing, and research and development. The reasons for this are many and diverse, but on the whole, it comes down to the fact that earthen has been left behind when it comes to moving into the large-scale construction modes that the US currently utilizes. There is a constant need for housing construction, but earthen materials are not positioned to take advantage of this. If this were to change, then the thought of exponential growth for earthen construction is not wishful thinking, but possibly an achievable goal. How to make this change happen is the question.

Earthen technology

The two words “earthen” and “technology” are seldom used together. Earthen construction is seen as an entirely niche market since it generally relies on small batch production of the materials used. Having the means to produce sufficient adobe blocks to meet the needs of a growth market has proven to be a bridge too far, but that can change with the use of technology to produce a more easily mass-produced earthen product: compressed stabilized earth blocks (CSEB). In many ways CSEB can and should be considered an engineered block, since it is the product of several steps of engineering, from the preparation of the raw materials to the operational production utilizing mechanically precise equipment to the testing and qualification standards that are necessary to ensure a safe and dependable product. Without disparagement, no other form of earthen product can achieve the necessary level of technological specifications to satisfy the mass production required for meeting the challenge of exponential growth. However, this supposition assumes that the CSEB produced are held to standards that other mass-produced construction materials are held to, ensuring that safety, reliability, consistency, and cost reduction, are essentially guaranteed. This will be the assumption carried forward as part of this analysis.

Industry analysis

One very useful approach that can illustrate the challenges faced by earthen construction is to employ the Strengths/Weaknesses/Opportunities/Threats (SWOT) tool. SWOT analysis is most often used as a means to determine business strategies based on the determinants within the four variables. It can also be broadened to cover an entire industry. For the earthen construction market and its growth, these are some of the critical determinants:

- ***Strengths*** – Sustainability, environmental responsibility, thermal performance, local resources, longevity of built structures, positive consumer perceptions.
- ***Weaknesses*** – Construction costs, weight of products, lack of standards, variability of products, lack of manufacturers, negative consumer perceptions, challenging or arcane construction regulations.
- ***Opportunities*** – Market appetite for natural/sustainable products, lack of imbedded manufacturers, need for durable structures to meet the challenges of climate change.

- ***Threats*** – Pushback from standard construction product manufacturers, poorly made products, government regulations related to production facilities, environmental regulations related to raw material harvesting.

In order to increase the market for earthen construction to any extent, much less an exponential increase, the issues highlighted by the SWOT analysis should be addressed. How individual businesses can do this is by finding methods and approaches that leverage the strengths, mitigate the weaknesses, exploit the opportunities, and lessen or render moot the threats. Not an easy task, but certainly one that could lead to far better outcomes than what we have been struggling to achieve for many years.

Wright's Law as applied to earthen construction products

Another functional approach, albeit not actually a tool, is to apply Wright's Law, also referred to as the learning or experience curve effects, to predict if the growth of the earthen construction market can increase exponentially. The learning curve affect predicts the lowering of costs per unit produced as more units are produced. The reasoning is that increased production activity leads to increased learning, which leads to lower costs, which can lead to lower prices, which can lead to increased market share, which can lead to increased profitability and even market dominance. The earthen products currently in use, adobe, rammed earth, and cob, are extremely difficult to produce in large enough quantities to achieve this learning curve effect. However, CSEB production, utilizing the positive aspects of increased mechanization, increased labor efficiency, standardization and specialization of production methods, and technological improvements, may and should be able to achieve it. This would indicate that as profitability increases, even at lower margins, more producers of CSEB will move into the market to meet the demand of growth in consumption of a higher performing, lower cost product. Simply put, increased access to a lower cost, higher performing product will spur growth in the earthen construction market, slowly at first but this elicits a positive feedback situation: the lower cost to build will spur construction, raw materials, and logistical companies to enter and compete. Their efforts will again trigger the experience curve effects which will drive competitive differentiation, in turn further decreasing the costs to build, driving a potential growth curve that, given the currently small earthen construction market, could easily become exponential.

The marketing mix for earthen products and construction

The marketing mix refers to the commonly used variables that affect strategic marketing decisions, often referred to as "The 4 P's of Marketing". These four variables are:

Product – the physical product or service offered to the consumer. In the case of CSEB, it also refers to any services or conveniences that are part of the offering. Product decisions include aspects such as function, appearance, packaging, service, warranty, etc.

Price – Pricing decisions should consider profit margins and the probable pricing response of competitors. Pricing includes not only the list price, but also bulk discounts, financing, and other monetary decisions that will affect cost to the consumer.

Place – Placement decisions are those associated with channels of distribution that serve as the means for getting the product to the target customers. The distribution system performs transactional, logistical, and facilitating functions. Distribution decisions include market coverage, logistics, providers of distribution points, and levels of service.

Promotion **–** Promotion decisions are those related to communicating and selling to potential consumers. Since these costs can be large in proportion to the product price, a break-even analysis should be performed when making promotion decisions. It is useful to know the value of a customer in order to determine whether additional customers are worth the cost of acquiring them. Promotion decisions involve advertising, public relations, media types, etc.

As growth in the earthen market occurs, this set of four variables must be adjusted and tuned to maximize the benefits to the companies involved.

To address **Product** issues, we must make standardization of the CSEB a mandatory goal, otherwise consumers will continue to see even this form of earthen as too risky to utilize. Other issues to take on include construction practices that, indirectly, affect the ease of use of CSEB and its performance in built structures.

To address **Price** issues, production costs must be controlled and streamlined, and the learning curve benefits exploited. While other cost factors play a role, the early gains must and will be in lowering the cost of CSEB production.

To address **Place** issues, decisions about where to produce CSEB, the rate of production at these locations, and how to ensure access and distribution of CSEB to the targeted customers.

To address **Promotion** issues, particular attention should be paid to the “low-hanging fruit”, the customers who already know and want earthen but have been put off by the costs and complexities associated with earthen construction. The lower total cost of a CSEB structure, given the stated assumption of CSEB being mass-produced, would entice these latent customers, and provide the target for initial promotional strategies.

Five Competitive Forces analysis

Michael E. Porter, Professor at Harvard Business School, created this particular tool to provide a means of evaluating the complex array of forces that affect industry profitability. For any strategic planner, this tool can deliver the critical information needed to create a functional business roadmap. Each business must operate within the industry that it chooses to compete in, often with little or uncertain knowledge of what the key elements of that industry are. This tool acts as a “focusing lens” that puts these elements into their respective categories and allows for moving forward with a living strategic plan. As more of these elements become known, feeding them into the plan will make it more complete and more achievable.

The Five Competitive Forces are:

- ***Competitors*** – Rivalry among existing firms. This runs the gamut from Amazon (few competitors, able to dominate the market) to McDonald's (many competitors, cannot dominate the market). Currently in the earthen construction products industry, there are very few CSEB manufacturing competitors that exist, indicating a very expandable industry.

- ***Potential entrants*** – Threat of new entrants. If hard to enter an industry, only a few will be able to compete resulting in the potential for the best firm to dominate. If easy, then many firms compete, and profits margins are thin. Currently the barriers to entry into the earthen construction industry are fairly high with the exception of those with experience in CSEB production.

- ***Suppliers*** – Bargaining power of suppliers. If there are only a few suppliers of critical industry materials, then these entities can become key (negative or positive) to the core industry and affect major parts of the industry. At this time, manufacturers of CSEB block making machines are particularly important.

- ***Buyers*** – Bargaining power of buyers. If there are only a few buyers of the industry products, then these entities can become key (negative or positive) to the core industry and affect major parts of the industry. Currently, it is possible that many buyers, from individual builders to construction industry giants may find CSEB-based construction to be economically feasible, even desirable.

- ***Substitutes*** – Threat of substitute products or services. If there are competing products to the core industry, like CMUs or framing in regard to earthen construction, these substitutes can and will take away from the industry if the cost differential between them is enough to force a buying decision. Lowering the cost and raising the quality of CSEB will keep this in check.

This is an extremely limited explanation of the Five Forces tool. This tool has the capacity to analyze nearly every facet of an industry, limited only by the amount of time and resource investment the user is willing to put towards it.

Summary and conclusions

The earthen construction industry struggles to gain legitimacy within the US market. Analyzing the reasons for this situation, understanding the issues that hamper further growth, creating the strategic plans to remove or control these issues, forming the infrastructure to allow the earthen construction industry to flourish, this is the reason for using business centric analytical tools. The tools described here are just a few that are available in varying degrees of complexity, but even the ones included here are far more complex than this paper can cover. However, by providing context to each of these tools using earthen construction industry inputs as examples should demonstrate that even our industry can be successfully and accurately analyzed.

Our industry, if we choose to put in the time, effort, and resources to make it a technologically competitive industry, is capable of exponential growth as demonstrated by this short, but compelling analysis. By taking deliberate actions, based on rational analysis and valid information, and predi-

cated on the use of CSEB earthen technology products, the exponential growth dream of earthen construction can and will be realized.

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James C. Moore *attained a BSME from UT Austin and MS and Ph.D. from The Ohio State University in Columbus OH. He has worked in materials modeling and simulation, including a startup in simulation based design. He designed wireless sensors for a tunnel boring machine under Niagara Falls (and other cool stuff), and now wants to see the best homebuilding material in the world find its way into homes.*

M. John Jordan*, MBA/MOT, BS is President of Paverde LLC and Vice-President of NeoTerra LLC. He has been working on CSEB technology for over 12 years, developing continuous CSEB manufacturing operations processes and improving the quality of CSEB through research and testing. M. John Jordan has been a board member of TEG for over 5 years supporting all types of earthen construction; ECI member. CSEB research multi-year grant winner of over $400K.*