



RUNNING THE RIGHT NUMBERS

LIGHTING  GLOBAL



AN INNOVATION OF
WORLD BANK GROUP

THE WORLD BANK **IFC** International Finance Corporation
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ABOUT LIGHTING GLOBAL



LIGHTING GLOBAL is the World Bank Group’s initiative to rapidly increase access to off-grid solar energy for the one billion people living without grid electricity around the world. We work with manufacturers, distributors,

governments, and other development partners to build and grow the modern off-grid solar energy market, which is expected to reach 740 million people by 2022. Our programs—which include Lighting Africa, Lighting Asia, and Lighting Pacific—provide market intelligence, quality assurance, consumer education, business support services, and support for access to finance, at the global, regional, and country levels. We are also poised to address new markets and opportunities that emerge as the off-grid energy sector evolves. Our activities now include support for the productive use of solar (e.g. solar irrigation & milling), community services (e.g. for schools and health centers), super-efficient household appliances (e.g. fans, TVs, household refrigeration), and innovative pay-as-you-go (PAYGO) business models that enable rural, low income populations to access modern clean energy solutions.

Lighting Global is managed by the International Finance Corporation (IFC) and the World Bank, with support from the Energy Sector Management Assistant Program (ESMAP). For more information about how and where we work, please visit www.lightingglobal.org.

ABOUT TIL VENTURES



Headquartered in London, TIL VENTURES is a consultancy that specializes in helping large corporations and multi-lateral organizations create new markets. High profile clients include Disney, Barclays, Phillips, Procter & Gamble, the World Bank, and the International Finance Corporation. The firm is headed by the two founding partners Milan Samani and Erik Simanis. The partners’ work has been published in various business journals and news outlets such as the Harvard Business Review, the MIT Sloan Management Review and the Wall Street Journal. Among its services, TIL designs and builds internal, company-specific incubators that target underserved and unimagined market spaces. TIL also operates The Intrapreneur Lab, an external accelerator that admits teams composed of full-time employees of their corporations. These corporate teams develop ventures alongside their day-to-day responsibilities.

ACKNOWLEDGEMENTS

This Lighting Global production is a collaboration between the International Finance Corporation and TIL Ventures, a London-based innovation consultancy that helps global corporations create the new and unimagined markets of tomorrow.

COVER IMAGE

Gideon Langat delivering solar lights to rural house in Bomet County, Kenya. ©Lighting Africa

AN INTRODUCTORY LETTER FROM LIGHTING GLOBAL

The off-grid solar industry has entered a new stage of development that requires substantial investment to progress to the next level. To access this working capital, firm-level profitability has replaced household connections and number of people reached as the main evaluation criteria.

Since 2010, 130 million off-grid lighting products have been sold, and in the last six years close to USD 950 Million was raised. Despite this, the off-grid solar industry still struggles to see commercial returns for investors. As business models become more complex and forge deeper to reach the last mile, it is important to have a granular understanding of the unit-cost economics that serve as the building blocks for sustained profitability. While profitability through economies-of-scale holds true in some business models, it may not for others, and can very well undermine the performance of the entire organization. Being able to accurately discern whether scale assumptions hold true is critical on the Path to Profitability.

Lighting Global sees value in presenting a different kind of approach to address the profitability challenge facing industry businesses, for both retail models and Pay-As-You-Go (PAYGO). In this book, you will find a unique tool kit and methodology to bottom-up analysis for operational mapping and related financial considerations. The core of this work centers on carving out the retail / branch level unit as the last link in the value chain (unit level P&L), and performing economic analysis that considers rural distribution limitations, PAYGO considerations, and penetration challenges that are often overlooked in traditional models. The impact of these considerations can make or break the profitability of the business.

This book is part of a knowledge series that includes practical tools, one-on-one consultations, and in-country performance assessments that has helped guide many of the world's most known companies in the off-grid lighting industry. We see this series as an adaptable framework that evaluates how hidden costs and inefficiencies in sales-channel-management ultimately impact commercial returns. The approaches and tools presented herein were selected based on their relevance to and effectiveness for the off-grid solar industry.

We hope you enjoy this read and the exercises. To learn more about the series, or how to adapt these tools for your company and employees visit <https://www.lightingglobal.org/work-with-us/associate-services/path-to-profitability/>.

Daniel Tomlinson
on behalf of Lighting Global
International Finance Corporation

INTRODUCTION

RUNNING THE RIGHT NUMBERS FOR RURAL ENTERPRISES

Meeting the bottom line is a must-have for ventures aiming to serve the Bottom of the Pyramid (BOP)—low income consumers that make up almost two-thirds of the world’s population. Profitable ventures can expand rapidly, improving the lives of millions of consumers, as the business’s future profits attract and pay for the investment capital needed to scale.

To make the numbers, managers and entrepreneurs need to know how to run the right numbers. And when it comes to the BOP, particularly the “last mile” consumers in out-of-the-way villages and disorderly slums of emerging and developing economies, the conventional approaches to modeling the business case can harbor dangerous blind spots—ones that ultimately obscure four key variables that shape venture success or failure.

The first blind spot of conventional models is one of *scale*. Conventional modeling approaches work top-down, focusing on aggregate, *venture-level* operations—on the forest, rather than the trees, so to speak. Venture operations and cash flows are modeled at the level of an entire country or region.

In many BOP ventures, however, the key choke points that make or break a business are rooted in the individual trees that make up the forest—in the last-mile *operating unit*, that is.

The last-mile **operating unit** is the smallest, self-sustaining entity within a larger venture with responsibility for sales and service in a defined territory. In micro-finance organizations like Compartamos, the operating unit is a branch office with a team of agents and support staff selling and administering loans in neighboring communities. In the case of WaterHealth International, a venture that sells clean water directly from community-scale purification centers, the operating unit is a single purification facility along with an operator and salesperson.

FIGURE 1 Last-Mile Operating Units—The Engine of a Venture



The second blind spot that conventional models suffer from is one of *scope*. Managers and entrepreneurs of new ventures often narrow their modeling focus onto the operations and profits flowing between their venture and their immediate paying customer. Those paying customers, however, are often sales aggregators—distributors, dealers, importers, and wholesalers—rather than end users.

In low-income markets, however, companies often face a downstream channel gap: the absence of a business (or network of businesses) that can profitably get a product from manufacturer to end user.¹

Filling this downstream channel gap often requires innovating a new business or ecosystem of actors that can profitably fulfill critical business roles, ranging from warehousing, marketing, sales, financing, cash collection, and after-sales service. If the total net margin across the *entire* upstream and downstream ecosystem isn't sufficient to provide a competitive return to all of the players, the new venture will fail—even if its own financials appear strong.

Because of these blind spots, managers and entrepreneurs of BOP ventures consistently fail to take stock of four critical last-mile operating unit variables that dictate economic performance for all ventures, but particularly for those targeting BOP markets:

THE VENTURE HEAD OFFICE

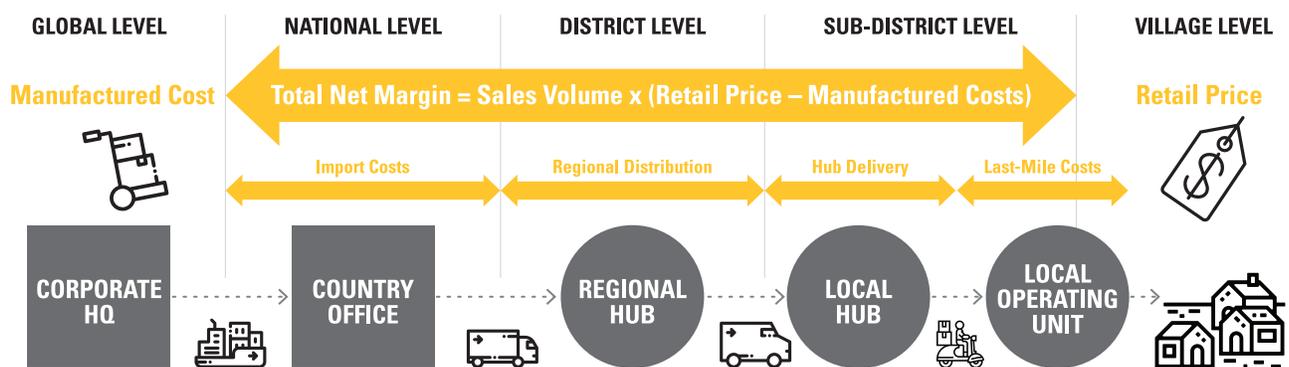
A key reason for concentrating certain activities in a Head Office is that it generates “economies of scale”: a decrease in the cost per unit of product or service delivered. The savings generated by economies of scale can be re-invested in the venture to improve quality and performance, or they can be passed on to customers and beneficiaries in the form of lower prices. It’s the presence of these scale economies that propels an organization’s growth in a financially sustainable way.

The Head Office also plays a critical management role. As you scale, the organization becomes bigger and more complex. The Head Office hires and mentors people to run operating units. It enables the organization to share learnings and best practices across operating units. And it ensures a consistent brand image and product offering.

- **Reachable Market (R):** the population of potential consumers accessible by the last-mile operating unit
- **Steady-State Penetration (P):** the percentage of the reachable market that are regular customers of the last-mile operating unit by the end of the venture’s investment period
- **Transaction Intensity (I):** the time required to service and support all of the transactions the last-mile operating unit conducts with its customer base over the course of a month
- **Customer Load (L):** the number of transactions that one staff person can manage in a month

Conventional models unwittingly overestimate reachable market (R) and penetration (P), and underestimate transaction intensity (I) and customer load (L). In this report, we will refer these critical last

FIGURE 2 Total Net Margins and Whole System Profitability



¹ Simanis, Erik & Emile Schmidt. “Selling More with Less: Filling the Channel Gap in the BOP.” Emerging Markets Business. Forthcoming

REACHABLE MARKET (R)

The last-mile operating unit's reachable market—the total potential number of customers that can be served by a unit—sets the upper limit on the last-mile operating unit's sales volume. For all ventures except fully digital offerings, the reachable market is primarily a function of the maximum geographic area that can be served in a financially sustainable manner.

Because of poor infrastructure, the reach of downstream last-mile operating units in BOP markets is relatively small, as it takes a lot of time for distributors, wholesalers, merchandisers, and sales people to get to the next village or another neighborhood in a slum. The marginal cost of going to the next village or neighborhood quickly exceeds the added margins gained. Similarly, consumers' movement is highly constrained. Public transportation, such as "trotros" in Ghana or "matatus" in Kenya, is relatively costly. In Ghana, the round trip cost of a five-mile trip using the trotro is approximately \$1.40. That equates to more than 20% of what the average 4-person farming family spends daily.

STEADY STATE PENETRATION RATE (P)

The operating unit's steady state penetration rate is the percent of the reachable market that are customers of the last-mile operating unit by the end of its project window—that is, the time period in which the venture's returns are evaluated, either by external or internal investors. Penetration rates are affected by several factors, including the novelty of the product offering, the presence of competitors, and barriers to competitor entry.

Penetration rates in BOP markets are pushed down by several factors. First, most of the new products targeted at BOP consumers represent very new functionalities—such as fortified foods, purified water, and solar energy. Driving adoption of new-to-consumer products takes significantly longer, as consumers need to learn new product routines that embed the product into their current lifestyles while managing disruptions to existing routines. The issue is exacerbated by BOP consumers' lack of a cultural competence for product consumption. The reason why is straightforward: They own and interact with a scant few products on a daily basis. For those of us born into a world of advertisements, shopping malls, and Black Friday sales, it's easy to forget that being an effective consumer is an acquired skill. Lastly, piracy in BOP markets remains prevalent, further cutting into a venture's effective penetration rate—both by cannibalizing a venture's sales, and by poisoning the brand should pirated products be of poor quality.

CUSTOMER TRANSACTION INTENSITY (I)

Monthly customer transaction intensity is the total time required each month to sell, deliver, and service the customer base. The main variables that dictate customer transaction intensity are the number of purchases made by a customer each month, and the customer interaction time required per sale (both first-time and repeat).

In BOP markets, purchase frequency is often significantly higher because consumers' low incomes and erratic cash flows decrease the quantity of product purchased in a single transaction, as smaller quantities reduce consumers' perceived risk. The time needed to convert consumers and generate repeat purchases are higher in BOP markets because of the need for face-to-face interaction to overcome consumers' lower levels of competence using and adopting products, and the absence of widely available communication technologies (e.g., smartphones).

CUSTOMER LOAD (L)

Monthly customer load is the number of customers that a single employee can manage each month. The main variables that dictate sales load is the amount of time needed to move between customers, and the efficiency of employees.

In BOP markets, significant time is often required to move from one customer to another, as informal villages and slums lack roads, addresses, and mapped dwellings. The issue is compounded by the poor quality of human resources in the lower-end of the labor market, which results in poor efficiency levels.

mile variables collectively as “RPIL.” The errors are unlikely to be uncovered, as RPIL aren’t variables typically monitored. Instead, pilots will continually fall short of profit targets, with the sales forces trolling for customers in villages and neighborhoods further and further away. Additional sales people and new channel partners may be recruited. But gains in sales are illusory, as the measures raise costs and, with them, the breakeven sales target. The race can never be won.

To help save managers, entrepreneurs, and investors time and money, this modeling approach puts RPIL center stage. The approach works backwards from the level of a single last-mile operating unit, backing out a price and margin needed for the whole system to be profitable at steady state.

The approach works equally well for new ventures and early stage ventures. For new ventures, it ensures there is a credible and realistic path to profitability before committing significant resources to pilot. The analysis also helps determine the “key performance indicators” (KPIs) and success drivers that pilots need to test out and closely track. For early-stage ventures with operations already on-the-ground, it allows teams to more effectively diagnose pinch points in the current business model and identify the corrective measures or pivots needed for profitability.

The next section illustrates how unique structural features of BOP markets transmit their impact through RPIL, and how conventional modeling approaches fall into a penetration trap. Part II of this document provides detailed descriptions of the two tools on which the new modeling approach is based, operational model mapping and bottom-up financial modeling, along with a case study that showcases them in action.

The Economic Drivers of Low Income Market Channels

Ventures looking to serve low-income, last mile markets invariably encounter a gap in downstream business ecosystems: the professional distribution channels that companies use to supply goods and services to middle and upper income consumers rarely reach into the slums and villages where BOP consumers live and shop. The reason is two-fold.

First, the low margins on which distributors in Tier 1, 2, and 3 cities operate—sometimes as low as

5%—depend on large economies of scale and tight cost control. Neither condition holds in villages and slums. Dispersed consumers, unorganized home settlements, and poor road quality constrain the efficient movement and delivery of goods, thereby pushing down revenues. Unreliable or non-existent electric grids, high levels of unbanked consumers, low literacy rates, and poor labor quality significantly drive up costs of business operations across the value chain.

Covering the higher downstream costs at lower revenues can only be solved one of two ways, neither of which is tenable for most ventures: 1) by reducing the price to the distributor, a move that cuts into manufacturer’s net profits, and dilutes its margins; or 2) raising the retail price, an approach that often pushes the price beyond low-income consumers’ willingness and ability to pay, and results in significant price inconsistencies across retail points for the same product.

The second reason for the channel gap is that the informal retail sector serving BOP consumers is poorly equipped to shape consumers’ purchasing decisions and effectively sell the new-to-consumer products often targeted at BOP consumers. Sales outlets are so small—250 square feet or less in many cases—that BOP consumers can’t browse store aisles, engage with point-of-sales materials, and comparison shop. Instead, they simply give storeowners their orders from behind a counter or through a teller-like window. And shop owners’ business skills and salesmanship are generally very poor. Most shops are family affairs in which different family members simply man the register at different times of the day.

Consequently, many BOP ventures are saddled with having to innovate entirely new downstream channels—not just new products. Numerous corporate efforts across industries have encountered this challenge, including SC Johnson’s venture in rural Ghana to sell mosquito and insect control products, Novartis’ Arogya Parivar venture in India that brings medicines to the poor, Shell Solar’s effort to sell photovoltaic home systems in Sri Lanka and India, Cemex’s Patrimonio Hoy venture in rural Mexico that sells cement, and Essilor’s Eye Mitra project to provide eyeglasses in rural communities across Asia, Africa, and Latin America.

Because of the scale and scope blind spots in top-down and upstream financial models, the entrepreneurs and managers behind these ventures often underestimate the operational challenges and limitations experienced by the last-mile operating unit. Those miscalculations turn up in four “foundation variables” that govern a last-mile operating unit’s revenues and costs: the unit’s reachable market (R), steady-state penetration rate (P), customer transaction intensity (I), and customer load (L).

The first two variables, R-P, together shape the last-mile operating unit’s revenue potential by dictating the unit’s number of customers, and thus, its sales volume. The second pair, I-L, drives the unit’s costs, as they dictate human resource requirements—one of the largest line items on profit and loss statements, as well as a key driver of other investment and operating costs (see box on page 7 for greater detail on RPIL in BOP contexts).

Under-estimates in foundation variables can quickly undermine any venture’s path to profitability—but particularly those targeting BOP markets. This is because the small scale of last-mile operating units magnifies the impact of miscalculations in RPIL: hiring an additional salesperson when the operating unit has a staff of five employees has far greater financial consequences than when the unit has 50 employees.

The first miscalculation made by entrepreneurs and managers is about the last-mile operating unit’s monthly transaction intensity (I): they underestimate the time needed to acquire, sell to, manage, and service customers on an ongoing

basis. BOP consumers, because they lack a “cultural competence” for trialing, adopting, and using new products demand significantly higher touch interaction. Illiteracy and limited smart phone penetration limit the use of mass-media channels, and push customer interactions into more time-consuming, face-face encounters. Where mobile money is not present, collecting cash takes greater time. Dispersed and unorganized home settlements further increase the time needed to move between customer visits. And because of their lower and sporadic incomes, purchase sizes/quantities are smaller, thereby increasing the number of transactions.

Underestimating transaction intensity (I) automatically leads to overstating customer load (L)—in other words, the number of customers that one employee is expected to serve each month demands more time than the employee has available. That miscalculation cascades through several layers of human resource estimates, starting with operating unit sales people, then to head office-level territory managers and marketers, and up to head office-level support services, like customer support and tech support.

Those miscalculations trigger underestimates in capital asset depreciation, as many assets—from cell phones, computers, printers, motorbikes, and office furniture—are dictated by the number of employees. Miscalculations in running costs and capital expenditures result in underestimates of the operating unit’s start-up working capital (i.e., the cost to cover shortfalls in expenditures before a new operating unit gets to break even)—a significant cost for ventures selling new products, as the time to reach operating unit break-even often takes longer.

When the last-mile operating unit’s cost structure is underestimated, its “profitability equation” goes out of balance (see Figure 4): cash coming into the unit, can’t cover cash going out. Cash coming into the unit is a product of the cash made on each sale by the total sales volume. Cash made on each sale, or “contribution,” is calculated by multiplying price by gross margin; total sales volume is the product of our two foundation variables, R and P.

To absorb additional costs, one of these four profit-side variables—Price, Margin, Reach, or Penetration—has to be increased. Unfortunately, that’s easier said than done.

FIGURE 3 Operating Unit Foundation Variables

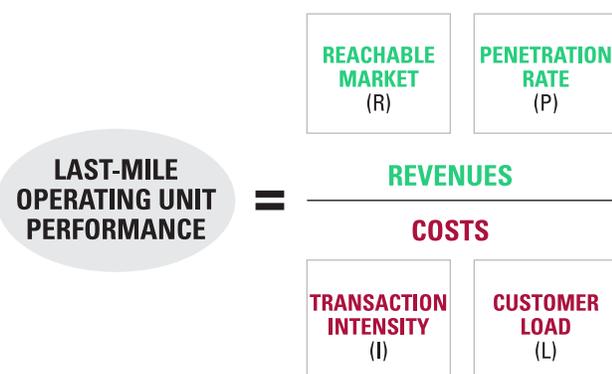
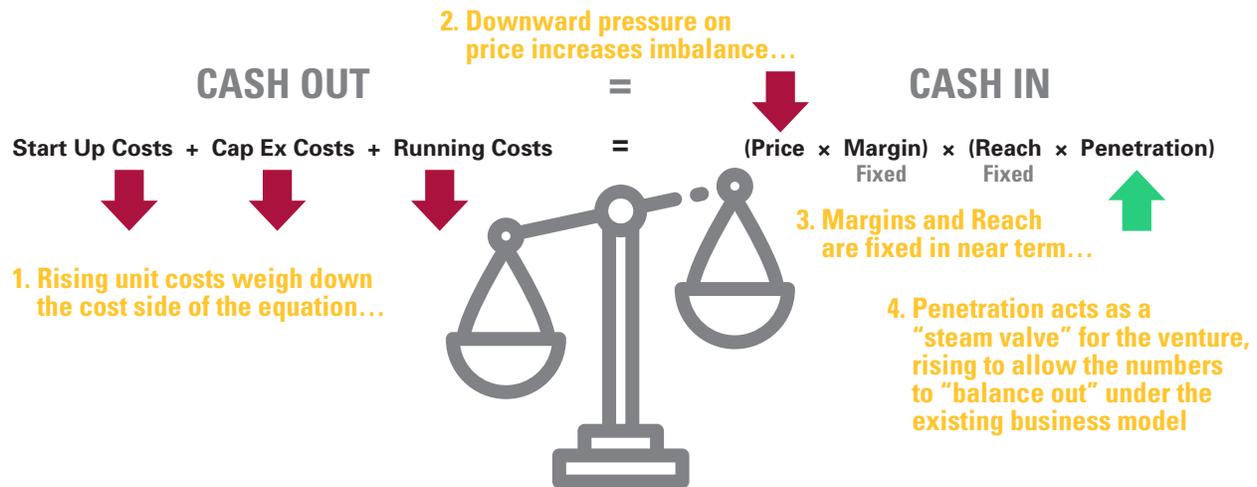


FIGURE 4 Balancing the Profitability Equation



Raising “Price,” while possible in theory, is often very difficult in practice, given competition, piracy threats, and BOP consumers’ limited ability to pay. Indeed, most ventures will be under constant pressure to lower prices, putting the profitability equation further out of balance.

“Margin” goes up when the variable cost of making a product decreases. To make products at significantly lower cost while retaining the same level of functionality and performance—a must-have in order to prevent prices from decreasing—requires a fundamental re-design. That is a difficult and expensive task. Nor is there a guaranteed successful outcome (otherwise, it probably would have been designed that way from the start). In short, it is not a realistic near-term or even mid-term solution.

Much like margins, an operating unit’s Reach (R) is also “hard-wired” into the fabric of a business. Many factors affecting R cannot be changed, such as quality of roads and communications infrastructure. Other factors, such as choice of transportation, can be changed, but those changes invariably drive up other costs, thereby offsetting the gains, unless other parts of the business model are also changed. For example, while the operating unit’s R can be increased by using motorcycles in place of bicycles, that change will also increase capital investment and operating costs. In short, increasing R is also a complex and time-consuming process, and one without a guarantee of success.

Managers and entrepreneurs intuitively recognize the challenges of changing Price-Margin-Reach;

they, thus, default to efforts that increase sales volumes. In other words, they bet on a rise in steady-state Penetration (P). In my experience, however, the Penetration rate required to balance out the profitability equation can quickly rise far above the venture’s initially targeted penetration rate—often times, to an unrealistic level.² I call this dynamic the “operating unit penetration trap.”

Figures 5 and 6 demonstrate the concept of the last-mile operating unit penetration trap. Figure 5 shows the change in penetration rate needed to cover the rising costs of a typical BOP operating unit serving a population of 20,000 people. The model assumes the product sold is a durable good with a lifespan of 24 months.

The first column outlines a baseline case, with monthly operating costs of \$1,000. The sale of one unit priced at \$20 with a 40% gross margin generates \$3.20 in contribution over 24 months, or \$0.33 per month. To balance out the profitability equation, the operating unit needs to sell to 3,030 households (\$1,000/\$0.33), for a penetration rate of 15%.

Each column thereafter shows the change in penetration rate with every 10% increase in monthly costs relative to the baseline case. Note how a 30% cost increase of \$300—a cost increase that can easily happen by hiring just one additional salesperson—raises the required penetration rate to 20%. That’s a **33% increase** in required penetration—a significant jump.

² Simanis, Erik. “Reality Check at the Bottom of the Pyramid.” Harvard Business Review. October 2012.

FIGURE 5 The Operating Unity Penetration Trap (a)

Households Reached By Unit	20,000	20,000	20,000	20,000	20,000	20,000
Monthly Operating Unit Costs	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000
Cost Increase %	0%	10%	20%	30%	40%	50%
Monthly Operating Unit Costs	\$ 1,000	\$ 1,100	\$ 1,200	\$ 1,300	\$ 1,400	\$ 1,500
Price	\$ 20.00	\$ 20.00	\$ 20.00	\$ 20.00	\$ 20.00	\$ 20.00
Gross Margin	40%	40%	40%	40%	40%	40%
Contribution, Gross	\$ 8.00	\$ 8.00	\$ 8.00	\$ 8.00	\$ 8.00	\$ 8.00
Repurchase Period, Months	24	24	24	24	24	24
Contribution, Month	\$ 0.33	\$ 0.33	\$ 0.33	\$ 0.33	\$ 0.33	\$ 0.33
B/E # of Households	\$ 3,000	3,300	3,600	3,900	4,200	4,500
Required Penetration %	15%	17%	18%	20%	21%	23%

FIGURE 6 The Operating Unity Penetration Trap (b)

Households	20,000	20,000	20,000	20,000	20,000	20,000
Monthly Operating Unit Costs	1,000	1,000	1,000	1,000	1,000	1,000
Cost Increase %	0%	10%	20%	30%	40%	50%
Monthly Operating Unit Costs	1,000	1,100	1,200	1,300	1,400	1,500
Penetration % @ 5% Price Cut	17%	19%	21%	22%	24%	26%
Penetration % @ 10% Price Cut	20%	22%	24%	26%	28%	30%

The penetration rate trap comes into stark relief when we factor in seemingly small price cuts, along with cost increases. In Figure 6 are the required penetration rates needed to balance out the profitability equation at a 5% price cut (a price of \$19), and a 10% price cut (a price of \$18) at the various cost levels

A 10% price cut coupled with a 30% cost increase requires the operating unit to have a **26% penetration rate** in order to balance the profitability equation—a **73% increase** over the initial targeted penetration rate of 15%.

To put a 26% penetration rate into perspective, Unilever’s Pepsodent brand of toothpaste, which was launched in the India market in 1993, holds an approximately 22% share of the toothpaste market—the single largest product category in the personal care market. Given that toothpaste is used by approximately 60% of India’s population due to low uptake in rural markets, Unilever has an effective penetration rate of only 13% (.22 × .60). Newer products—from solar lanterns and water purifiers to fortified foods and mosquito nets—should expect a significantly lower penetration rate.

Because conventional models are neither modeling nor actively monitoring the last mile operating unit’s RPIL, the rise in the required penetration rate remains hidden from view. The effects however, as noted earlier, come in the form of pilots caught in a perpetual state of trying to grow sales—either by recruiting more salespeople, trolling further away for new customers, or starting new operating units, as the underlying belief is that the venture’s profitability will eventually balance out. But as the calculations above demonstrate, the efforts are futile, as the required penetration rate has risen to a level that can never be attained.

The only way to get out of the penetration trap is to do what entrepreneurs call a hard pivot: the entire business model needs to be re-designed to enable it to slash costs and/or generate significantly higher revenues. Re-starting from a hard pivot is a year-long process, as it often entails new product development, recruiting and/or re-training of sales staff, new marketing collateral, and new pilots tests in communities with customers “uncorrupted” by the previous offering.

Because of the time value of money, the impact on investor returns of a one-year delay is significant:

even without accounting for the additional costs of the pivot, a mere one-year delay in profits on an initial five-year investment targeting a 25% return slashes investor returns to approximately 19% (depending on annual sales growth assumptions), with a two-year delay pushing returns down to 15%.

Had the modeling been done properly from the beginning, the need for a hard pivot could have been detected and averted before time and resources were invested into the pilot. The goal, therefore, should be to work out hard pivots on paper, not in the field.

Overview: Operational Model Mapping and Bottom-Up Financial Modeling

This modeling approach is designed to avoid this pattern precisely. The approach uses two tools—operational model mapping and bottom-up financial modeling—to ensure that a venture can be credibly operationalized and go to market at a price/margin with a clear path to profitability for the whole business system.

Operational model maps and bottom-up financial models are conducted with a view of the venture “at scale” and at “steady-state”—that is, when the venture’s operations have matured and reached their maximum size in the time period that investors expect to realize returns. Ventures are modeled at scale to give a realistic snapshot of a venture’s potential, as it

captures future operational and cost efficiencies. Put another way, if a venture is unable to demonstrate that it can profitably operate at scale when the conditions are most conducive to success, it is immaterial what sales and cash flows are in years 1, 2, and 3.³ Modeling the venture at scale also helps ensure that the growth and scaling strategy are thought through (e.g., franchise, licensing, distribution partners) and associated costs are captured.

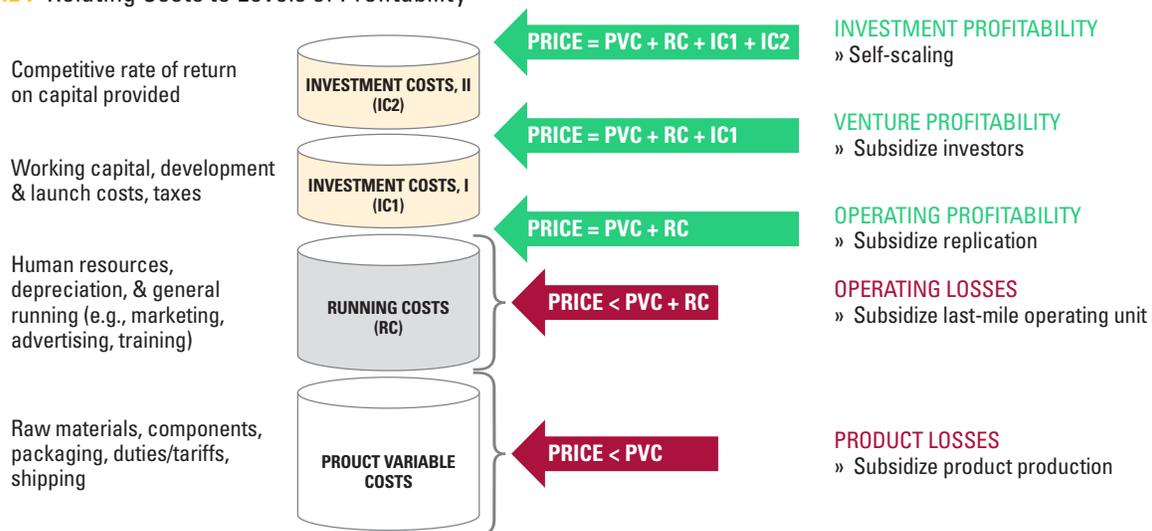
The modeling approach is also designed to reflect full **investment profitability**—a venture that can grow and sustain itself fully on the profits generated by its last-mile operating units. A venture achieves investment profitability when the price point for its products covers the last-mile operating unit’s “**whole costs**” at scale.

These “**whole costs**” are comprised of the:

- **variable costs** of the products sold by the unit.
- **unit’s running costs**, and share of **head office running costs**.
- **unit’s investment costs** and share of **head office investment costs**.

Variable costs are the costs associated with making a product—including raw materials, packaging, shipping, and duties and tariffs. A venture whose price is set below the variable costs of its product is suffering **product losses**. Such a venture requires continual cash infusions to subsidize product production.

FIGURE 7 Relating Costs to Levels of Profitability



³ Yearly cash flows are critical calculations once a venture is in pilot phase with a clear business model settling out, and a formal launch of the venture imminent.

Running costs are those associated with the ongoing operation of a business. They include human resources, capital asset depreciation, and general running costs. A venture whose price point is less than the sum of a product’s variable costs and a product’s share of running costs is suffering **operating losses**—a continual inflow of money is required to allow the last-mile operating unit to remain afloat.

On the other hand, a venture whose price point is equal to the sum of a product’s variable cost and its share of running costs has attained **operating profitability**—the last-mile operating unit can run-on in perpetuity without subsidies. Subsidies, however, are needed to scale the venture, as the venture doesn’t generate enough profit to cover the costs of starting up a new last-mile operating unit.

Investment costs are those associated with starting up and funding a business. Start-up costs consist of development costs, launch costs, and start-up working capital. Funding cost consists of the cost of debt and equity capital provided by investors to start and grow the business.

A venture selling at a price equal to variable costs, running costs and start-up costs has reached **venture profitability**—the venture can grow and expand as long as there isn’t a need to pay a return on any capital required. In other words, either the business owner is content to simply receive a salary rather than a return commensurate with the capital he/she invested and

the risk they assumed, or external funders are lending funds at concessionary rates.

Investment profitability is reached when a venture sells at a price point equal to or greater than the sum of variable costs, running costs, start-up costs, and funding costs. This is a venture capable of being publicly traded (i.e., listing shares on a stock exchange), as investors in such a venture are rewarded with a competitive return on their investment.

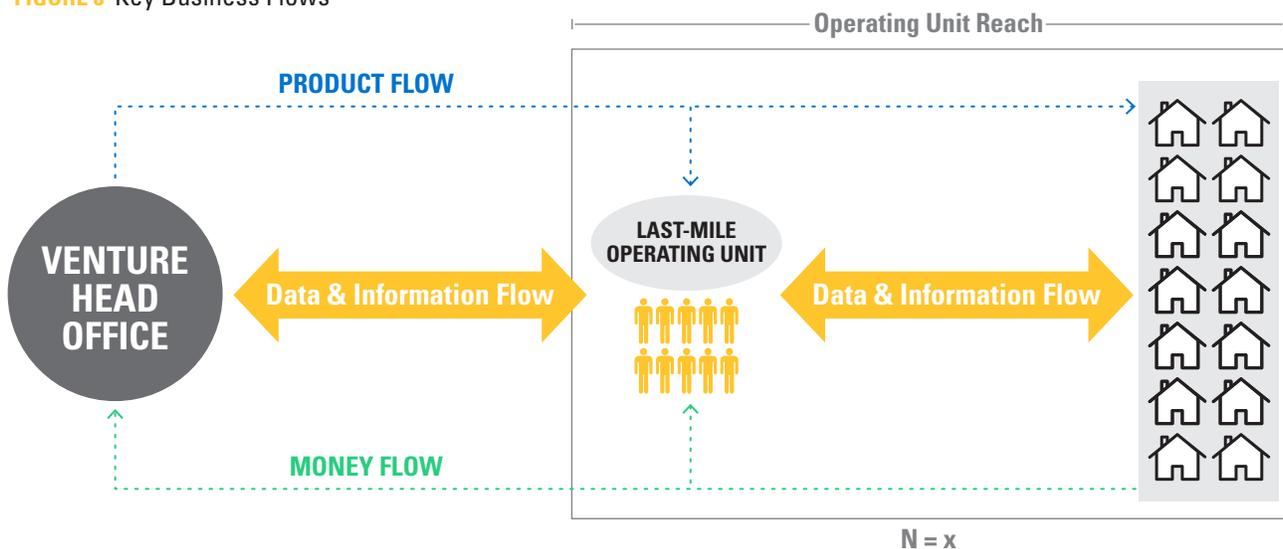
Operational model mapping and bottom-up financial modeling work in tandem, with inputs from the operational model map feeding into the financial modeling process. Operational model maps indicate *what* needs to be moved across the whole business system and how they get moved. The bottom-up financial model takes those inputs and then determines *how much* needs to be moved and at *what cost* those activities are executed. Following is a brief overview of both tools and how they support one another.

Operational Modeling Mapping

Operational model maps are graphical representations of a venture. They depict three key business flows:

- **Flow of product (and/or service) components** from manufacturer to end user
- **Flow of data and information**—between manufacturer, end user and any partners
- **Flow of money** from end user back to the manufacture

FIGURE 8 Key Business Flows



1. Flow of Product (and/or service) Components

There are three types of product components: “core,” “support,” and “enabling.” Core and Support components are the different parts of an offering that make up the customer’s complete product experience. They can include packaged physical products, digital products, services, technical support, and warranty service.

Enabling components include things the customer needs to have or use in order to access a product and its benefits. A product activation code, a product registration card, and a user manual are examples of enabling components for tangible products. For digital products, examples include key codes and USB sticks.

2. Flow of Data and Information.

There are two main types of data and information: marketing information, and production information. Marketing information is what’s directed at target customers to make them aware of and purchase the product. Marketing information includes things like advertisements in newspapers and radio, online ads (e.g. google, facebook), mega-phone miking, and product demonstrations.

Production information is what moves among customers, supply chain partners, and the company so that all actors in the business ecosystem know what to make, when to make it, and how much to make. Examples include customer data, inventory levels, and warranty claims.

3. Flow of Money

Money includes payment transactions made among the actors in the business ecosystem. From the venture’s

perspective, it includes both money received (sales), as well as money paid out (expenses). Examples include bulk sales to intermediaries (e.g., case sales to distributors), unit sales by retailers, unit commissions to sales agents, and margins to sales partners.

The mapping process consists of 4 steps:

Step 1: List out on individual post-it notes the key People and Places involved in the production, delivery, and sale of the offering.

Step 2: List out on individual post-it notes the three business flows: a) the Product components going to the end-user; b) critical Information moving among People and Places; and c) the Money transactions taking place among People and Places.

Step 3: Lay-out the People and Places starting with the venture head office and terminating with the end user, and draw the flow of Product, Information, and Money among them. Bracket the various operating unit levels in the venture.

Step 4: Determine the range of business activities and staff needed at steady-state to support the flows.

The business activities that need to be performed at steady-state, and the staff required to perform these activities, are key inputs to Step 2 of the bottom-up financial model discussed below.

Bottom-Up Financial Modeling

Bottom-up financial modeling is a financial analysis of a venture from the perspective of a single, last-mile operating unit working at steady-state. The model works backwards, calculating the operating unit’s whole costs and then using that cost to determine the price/margin needed for investment profitability.

FIGURE 9 Operational Model Mapping

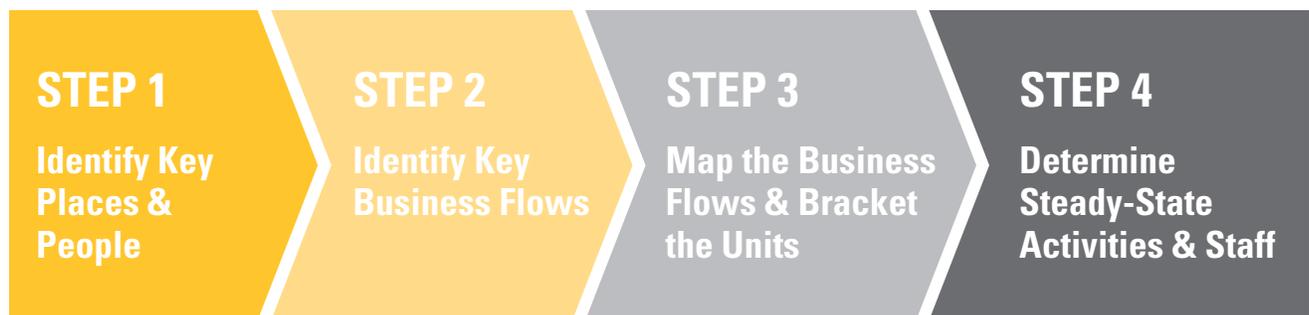
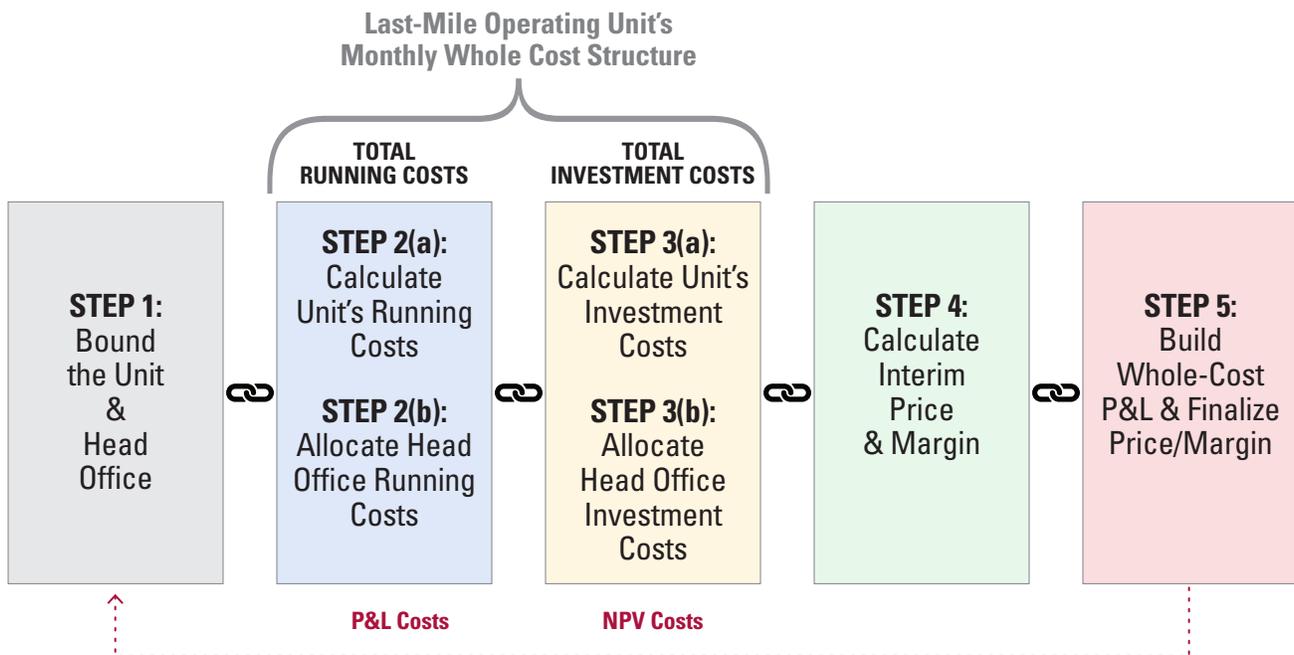


FIGURE 10 Bottom-Up Financial Modeling



Bottom-up financial modeling has five, tightly coupled steps (see Figure 9 below) to ensure that at-scale pricing absorbs an operating unit's whole costs.

- **Step 1:** Bounding the Operating Unit and Head Office—calculates the number of customers that the last-mile operating unit serves at scale, and the number of sales transactions the unit conducts each month with those customers. It also calculates the number of last-mile operating units managed by the head office at scale.
- **Step 2:** Calculate Total Running Costs—uses the monthly customer base and sales transactions (from step 1), along with inputs from the operational model map about business activities, to calculate the unit's monthly running costs. It also calculates the unit's share of head office running costs.
- **Step 3:** Calculate Total Investment Costs—uses the unit's monthly running costs (from step 2) to determine its monthly investment costs. As in Step 2, the unit's share of head office investment costs is also calculated.

- **Step 4:** Calculate Interim Price/Margin—uses the outputs of steps 1–3 to calculate an interim price/margin at which all monthly whole costs (i.e., running costs + investment costs + share of head office costs) are absorbed by the unit's monthly transactions.
- **Step 5:** Build Whole Cost P&L—uses the outputs of steps 1-4 to build a Whole Cost Profit and Loss Statement of the venture at steady state, and to then finalize the required price/margin needed to generate the investment returns specified in Step 3.

Detailed descriptions of both tools and examples of their application are found in Part II of this document.

Moving Forward with Rigor

When managers and entrepreneurs first apply the modeling framework, they find that the price/margin needed for investment profitability exceeds (significantly, in many cases) what customers have indicated they would pay for the product, and/or the price point currently charged in a pilot. That is natural, and a reminder of the challenging economics behind

BOP markets. It's also an invitation to re-visit key components of the business model in order to balance the profitability equation and put the venture on a path to profitability.

Cost Drivers

Used properly, the model itself provides guideposts for identifying “cost-drivers”—the cost categories and line items that make up the largest percentage of the venture’s whole costs and, therefore, act as leverage points for disproportionately lowering costs. Cost drivers can be identified by dividing each cost line item by the Whole Costs, with cost drivers being those with the highest percentages.

Cost drivers can then be traced back to one of the two bottom-line foundation variables of transaction intensity (I) or customer load (L). By focusing innovation efforts on one or both these foundation variables, managers and entrepreneurs can create significant, step-changes in the venture’s cost structure.

High transaction intensity, for example, may lead to large sales staffs, high training costs, large travel budgets, and high capital expenditures. Time-based pricing strategies, which charge customers based on a unit of time (e.g., per month) rather than on a unit of product, is one strategy for significantly reducing transaction intensity. The cost reduction comes from selecting a unit of time that equates to multiple purchases of a product as currently configured, thereby reducing the number of customer interactions altogether.

If customer load (L) is the venture’s Achilles heel, selling to customer groups rather than individuals can make a dramatic difference, as one sales interaction serves what otherwise would be multiple customers. Microfinance—which typically gives out loans to groups of women five or larger—is largely profitable because of the economies of scale this one business model innovation enabled in customer load.

Innovations that significantly expand revenues and margins should also be explored—increasing margins and revenues while keeping the cost base unchanged has the same impact as reducing costs while holding revenues constant. Here too, innovations that target the top-line foundation variables of customer

reach (R) and market penetration (P) can have disproportionate impact.

Customer reach (R), for example, can be impacted through different choice of transportation (e.g., motorbikes, drones), by converting physical products and services over to digital platforms, and by utilizing logistics models that leverage informal channels. Steady-state penetration (P) can be boosted through strategies that increase market share, such as customer lock-in strategies (e.g., loyalty awards programs, online brand communities) that increase customer switching costs to competitors.

Penetration of the overall market can be increased through strategies that accelerate adoption of new products, such as the use of “product bundles.” Product bundles blend new products with products that are already well-established in customers’ lives. For example, in a venture aimed at reaching low-income rural consumers in Ghana, consumer products company SC Johnson sold a “home care kit” comprised of four SC Johnson products that included mosquito control products (very new products) an air freshener (a commonly used product), and a surface cleaner (a common used product).⁴

Business Model Iteration

It is important to note that strategies impacting foundation variables cannot be simply tacked onto an existing venture. Rather, they typically require a whole series of changes in the underlying business model, including the product design, the customer value proposition, brand positioning and marketing messages, cash collection, and value chains and delivery partners. Therefore, as a business model is iterated on paper, it’s important to corroborate new assumptions where possible to help ensure the model will more readily translate into practice. This can be done through rapid user research, benchmarking, and quick hypothesis testing.

Once managers and entrepreneurs converge on the business model that balances the profitability equation and can be credibly operationalized at scale on paper, the updated financial model continues to provide direction on *what* to prototype and then *where* to focus management attention as the venture transitions from prototype to pilot test phase.

⁴ For a menu of strategies to slash costs and boost revenues, please see Simanis, Erik and Emile Schmidt, “Selling More with Less: Filling the Channel Gap in Low Income Markets,” Emerging Markets Business, 2018 (forthcoming).

Prototyping and Sensitivity Analyses

Prototyping a venture—that is, systematizing a product offering and brand, along with the key business management systems and value chain to ensure a necessary level of quality, professionalism, and rigor from start of pilot sales—is not a question of simply launching operations. Rather, it is a systematic process of testing out and evolving the business model. The prototyping process is guided by the critical variables that make or break the model—that is, the factors that significantly change the venture’s fortunes, either by significantly raising costs or cutting revenues.

To determine key prototype variables, managers and entrepreneurs should conduct sensitivity analyses on the business model’s financials. Sensitivity analysis is a process of altering assumptions about variables in order to gauge the magnitude of any changes on profitability. Variables, where small changes in current assumptions significantly affect profitability—whether around the variable cost of making the product, the product transportation cost, the commission paid on a digital financial transaction, or the distance a salesperson can travel in a day—are those addressed first. Research and testing is done to either validate or reject the current assumption and *increase the level of confidence* in the underlying assumption.

When assumptions are generally validated and the level of confidence around them is deemed sufficient, the next set of critical variables as revealed through sensitivity analyses are targeted. Whenever assumptions are rejected, the operational model is revised, the financials re-run, and the prototyping process re-started. Approaching venture development in this manner ensures time and resources are focused on the issues that matter most to venture success, and that the business model continually evolves with a line of sight on venture profitability.

Revenue Pilot Test

When prototyping is completed and a minimum viable venture is systematized, the focus shifts to conducting a revenue pilot test. The goal of a revenue pilot test is to evolve and prove out a sustainable business model—in other words, to determine the operational

model whose combination of demonstrated costs, price point/s, and penetration rates will allow the venture to sustainably serve customers and pay back all funders.

As in prototyping, the revenue pilot is structured around “key performance indicators” (KPIs)—that is, the variables that disproportionately impact the venture’s performance. Sensitivity analysis, once again, reveals the KPIs for the pilot test. As the pilot operates, the actuals are continually compared to targeted KPIs. If it appears the targeted number is not realistic, the financial model is updated and the operations adjusted to bring the profitability equation back into balance.

Conclusion

To be clear, while this financially-driven approach to designing, prototyping, and pilot testing a venture will improve the odds of success, it does not guarantee success—new venture creation is an inherently risky business. In addition, well-crafted plans are only valuable to the extent that they are converted into a rigorous business practice.

Effectively testing and evolving a model requires systematizing operations and processes, and then codifying standard operating procedures so that the source of variances in targeted KPIs can be pinpointed. Maintaining operational integrity requires a traditional suite of management control systems—from sales reconciliation and inventory management, to customer relationship management and employee evaluation—supported by good data collection practices.

Together, these practices ensure that—succeed or fail—a new venture team or entrepreneur has reached the ultimate verdict with minimal outlay of resources and time, and that the venture is poised to grow its success if and when proof of concept is ultimately demonstrated. It is this rigor, discipline, and preparation that ultimately leads to a team’s success, as it gives senior managers and investors the confidence to invest in the team a second and third time around. And with each new opportunity, a team’s knowledge and experience deepens, and the path to investment profitability comes into sharper focus.

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