Revenue Management Fundamentals

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Introduction

A Little ROI History

In the summer of 1914, a young staffer in the general management office was tasked by the company president to develop a detailed report on the operating performance of all the company's departments. The company was DuPont. The young staffer was Donaldson Brown, who would go on to a meteoric rise in one of America's great companies, followed quickly by another impactful career as an executive and director at General Motors. Brown's story, though fascinating, is not so well known as the management accounting tool he developed in 1914 that transformed DuPont and, beginning in 1921, was used subsequently to save General Motors. That tool, often referred to as the DuPont formula, is the return on investment (ROI) computation.[1]

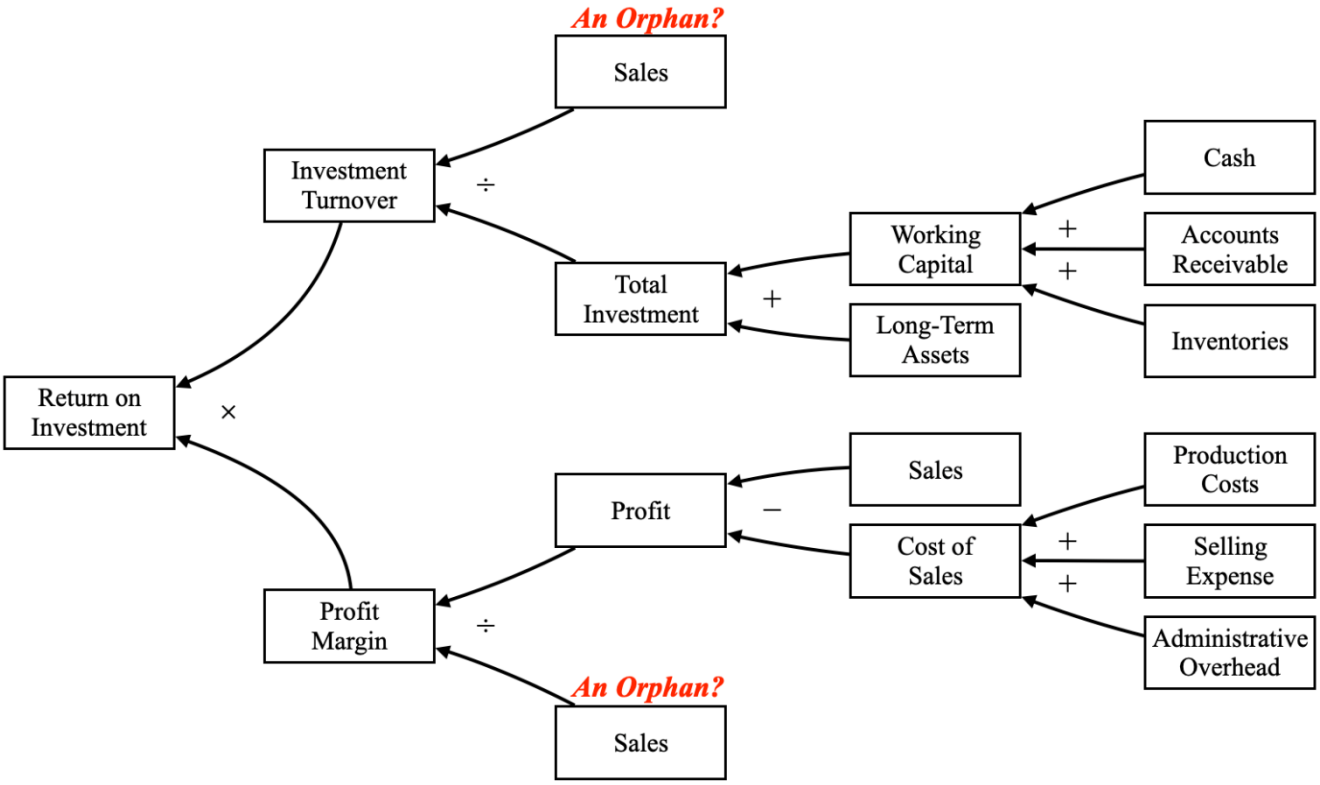
The classic ROI (DuPont) formula has been a mainstay in management accounting and corporate finance for nearly 100 years. In its original form, Brown developed ROI as equal to investment turnover multiplied by profit margin. Consider the actual math for this management accounting tool:

$$\frac{\text{Profit}}{\text{Investment}} = \frac{\text{Sales}}{\text{Investment}} \times \frac{\text{Profit}}{\text{Sales}}$$

Which component is most present (i.e., impactful) in the ROI computation? The most impactful component is, of course, sales (or revenue). In fact, sales has not two, but three impact points in ROI. (Remember that Profit = Sales – Cost.) Strangely, revenue management is not a central focus for management accounting systems in most organizations. This characteristic may be explained by the inherent nature of the traditional DuPont model (see Figure 1).

[1] Dale L. Flesher and Gary John Previts, "Donaldson Brown (1885-1965): The power of an individual and his ideas over time," *Accounting Historians Journal*, June 2013, pp. 51-78.

Figure 1: The Historic DuPont ROI Model



Adapted from T.C. Davis, *How the DuPont Organization Appraises its Performance*, American Management Association, New York, N.Y., 1950.

In this model, sales is essentially an "orphan" component. Unlike costs and investment, this model does not indicate any forerunning sources or root causes that describe or define how sales functions. The message of this orphaning in the DuPont model may explain why traditional corporate finance has focused too much on cost management or investment management at the expense of revenue management.

A key change thus required in management accounting thinking is that a major reason resources are acquired and employed by organizations is to acquire revenue, either in the form of sales or valued service (e.g., public service or charities). This, in turn, requires a greater focus on client needs and the recognition of variations in need for different clients. Segmenting clients into groups based around need is also described as market segmentation, but the missing link is the coupling of resource use with each group. The "any color that he wants so long as it is black," attributed to Henry Ford, suggests a supply side-dominant view where revenue took second place to cost management. Yet in his autobiography, Ford's third principle suggests that service (or a focus on clients) was dominant: "…profit must and inevitably will come as a reward for good service. It cannot be the basis—it must be the result of service."[2]

[2] Henry Ford and Samuel Crowther, *My Life And Work*, Doubleday, Page & Company, Garden City, N.Y., 1922.

Client segmentation tends to be a marketing issue in many companies, but most managers understand that effective segmentation also involves product or service design, production and delivery involving all activities, and resources within an organization. Understanding how servicing different client groups drives revenues must also encompass how different client groups drive costs; typically, the same driver applies to both. Revenue and cost management are two sides of the same coin. Neglect of one will hinder the other.

Revenue management does not go without attention in most organizations. Yet too often that attention is in the hands of marketing and sales managers without the full support and expertise of management accountants and financial analysts. That gap presents a competitive opportunity for organizations and professionals to invest in rigorous causal modeling, analytics, and systematic support of revenue drivers that can dramatically move forward value creation. Again, revenue management work is taking place in organizations, but this monograph presents an argument, and an opportunity, for management accounting to strengthen and accelerate that work.

Commentators have noted that the lack of a comprehensive revenue management framework hinders the study of how management accounting functions support customer value and profitability across all types of competitive organizations.[3] Revenue management models, often described as yield management models, have been established and applied in organizations for many years. These models are limited to particular types of organization structures operating in specific types of markets. This MONOGRAPH sets out a descriptive framework for revenue management that can be applied across all types of competitive organizations and industries.

We begin this monograph with a self-assessment process for identifying improvement opportunities in your organization's revenue management practices. Next, we define the key characteristics of revenue management work. We then establish context factors that organizations should consider when designing their revenue management strategy and systems. We then present a template similar in nature to the sophistication levels approach as laid out in the IMA monograph *Developing an Effective Managerial Costing Model*.[4] Organizations can use this template to assess the sophistication of their own revenue management system with respect to intended strategy in order to determine if further investment is needed. For many years, the management accounting discipline has invested in modeling cost causality and cost drivers. In concert with that work, we establish in this monograph a classification scheme for modeling causal revenue drivers. This work is presented to harmonize with modeling concepts presented in the IMA Conceptual Framework

[3] Ronald J. Huefner, "Incorporating Revenue Management into Management Accounting Courses," *Journal of Higher Education Theory and Practice*, 2015, pp. 32-36; Jeff Shields and Michael D. Shields, "Revenue Drivers: Reviewing and Extending the Accounting Literature," *Advances in Management Accounting*, December 2005, pp. 33-60.

[4] IMA Managerial Costing Task Force, *Developing an Effective Managerial Costing Model*, IMA, April 2019, www.imanet.org/insights-and-trends/strategic-cost-management/developing-an-effective-managerial-costing-model.

for Managerial Costing (CFMC).[5] Finally, we describe the range of data analytic practices that management accountants can choose to deploy in support of revenue management.

The appendix presents brief case studies on how three separate organizations describe the intensity of their own revenue management practice using the sophistication levels we provide in this monograph.

Overall, this monograph provides an essential foundation to understanding revenue management as a discipline across many types of organizations and how management accountants can work effectively with their organization to design systems that capture and analyze specific types of revenue drivers in order to improve revenue management practices.

Is This Monograph for You?

A six-step methodology is described below that can be used to develop a revenue management approach where management accounting is an effective partner with other business functions.

To improve the organization's revenue management approach, a cross-functional team should make an initial assessment of the organization's current revenue, customer, and market practices; develop a revenue management system that is appropriate for the business needs; and then implement a system tailored to the organization's objectives and the needs of its various business functions.

This process can be accomplished in six steps, which are detailed subsequently in this monograph. The six steps are as follows:

Step 1: Do a quick assessment of the organization's use of the four revenue management levers.
Step 2: Review levels of revenue management details to determine current practice and understand different intensities of practice.
Step 3: Analyze the organization's business strategy and business environment to find issues that can assist or hinder revenue management improvement.
Step 4: Evaluate revenue and cost driver importance in the organization's strategy and identify gaps in current managerial and accounting attention.
Step 5: Engage with other functional roles to design the appropriate level of revenue management and revenue driver attention for the organization, consistent with its strategy.
Step 6: Establish a cross-functional team to implement new revenue management practices, supported by management accounting skills and tools.

The description, along with recommended tactics and tools, are provided for each step in the following sections.

Step 1: Do a quick assessment of the organization's use of the four revenue management levers.

[5] Larry R. White and B. Douglas Clinton, *The Conceptual Framework for Managerial Costing*, IMA, September 2014, www.imanet.org/insights-and-trends/strategic-cost-management/conceptual-framework-for-managerial-costing.

The purpose of the quick assessment is to evaluate how your business's context and practices affect the relevance for revenue management. This can help get early buy-in from top management and other business functions on the need to develop the organization's revenue management approach. As the role of the management accountant is to partner with other business functions, this buy-in is critical.

An initial quick assessment can be made by answering the questions in Table 1. This table is organized by the four levers of revenue management (defined in the next section, "Defining Key Characteristics of Revenue Management"), business setting, and the role of current management accounting information to support decision making. Answer "yes' or "no" to these questions. The more "yes" responses in any given section indicates the importance and value for your organization of investing in revenue management practices. The subsequent sections point you to different sections of the monograph to learn more. Regardless of the score, most companies can benefit by critically reviewing their revenue management approaches and the management accounting information provided to other business functions.

Table 1: Quick Assessment of Revenue Management Practice

Four Levers of Revenue Management

Pricing basis:

- Do you tend to charge the same price for your products or services to all customers?
- Are your prices based mainly on costs and/or direct responses to competitor price movements?

Inventory allocation:

- Do you sell your product or service on a first-come-first-served basis?
- Do you charge the same price for your product or services during both high- and low-demand periods?

Product configuration:

- Does your product or service range require a wide variety of different resources to produce?
- Does your product or service innovation usually involve radically new products?

Duration control:

- Do you have the same operating procedures during both busy and slow periods?
- Do you accept variation in customer behavior as a given?

Business Context

Varying demand:

- Are there periods when you have too much capacity and periods when you have too little capacity?
- Do you experience wide variation in customer demand across time periods?

Perishability:

- Is it difficult to store your finished product or delay the availability of your service?
- Are your business's outputs subject to loss of value over time?

Customer variation

- Does your business serve a wide variety of customers who vary in their needs and willingness to pay for your product or service?

Role of Management Accounting Information

- Do business functions such as marketing, sales, and distribution consider your cost information irrelevant?
- Do your business functions work on different strategic goals with limited coordination?
- Is the accounting information provided for decision making in your business primarily focused on costs or budget targets?

Step 2: Review levels of revenue management details to determine current practice and understand different intensities of practice.

If you answered "yes" to one or more questions in the Four Levers of Revenue Management section, your business would benefit from closely examining the relevant revenue management practices. See the next section to learn more about each practice.

Step 3: Analyze the organization's business strategy and business environment to find issues that can assist or hinder revenue management improvement.

If you answered "yes" to one or more questions in the Business Context section, your business would benefit broadly from revenue management practices. See the section "Aligning Revenue Management Practices with the Business Context" to learn more.

Step 4: Evaluate revenue and cost driver importance in the organization's strategy and identify gaps in current managerial and accounting attention.

If you answered "yes" to one or more questions in the Role of Management Accounting Information section, your management accounting information may be too focused on cost analysis for internal decisions without supporting the analysis of revenue. See the section "Revenue and Cost Drivers" to learn more.

Step 5: Engage with other functional roles to design the appropriate level of revenue management and revenue driver attention for the organization, consistent with its strategy.

After reviewing the information in this monograph for steps 2 to 4, you should have a clear view or plan for improvement, including the following.

- The current use of the four levers in the organization.
- A desired revenue management approach.
- An understanding of how contextual factors hinder or assist revenue management development.
- A map of key revenue and cost drivers.

“Data Analytics to Support Revenue Management” outlines the role of analytical thinking to inform revenue management practice. It describes the types of information and data collection needed.

Step 6: Establish a cross-functional team to implement new revenue management practices, supported by management accounting skills and tools.

With a revenue management approach designed specifically for the organization’s business context, cross-functional support is crucial to the final step of implementing a specific revenue management solution across the organization that is based on clear measures, aligned incentives, and coordinated systems and structure.

Defining Key Characteristics of Revenue Management

Evolving Yield Management Forward

Returning to history, the deregulation of the U.S. airline industry in 1979 created tremendous competitive pressure on airline revenues. Robert Crandall, CEO of American Airlines at the time, worked with his company to develop an analytical approach to varying the proportion of discount and full-fare seats on a day-by-day, departure-by-departure basis.[6] This work dramatically changed the airline reservation system SABRE (Semi-Automated Business Research Environment) and evolved into a revenue optimization approach known as yield management. Using yield management, airlines formalized and focused on the accounting measure revenue per available seat mile (RASM), alternatively referred to as "passenger load factor."

Yield management (comprising operations, economics, and marketing tools) is a revenue management practice that applies to very specific market and company structure characteristics. Typically, yield management techniques apply when three specific circumstances are present:

1) A fixed amount of inventory is available for sale,
2) The inventory is perishable (i.e., inventory has no value after passing the deadline to sell), and
3) Different customers are willing to pay different prices for the inventory.

Revenue management has a broad concept of inventory ranging from conventional stocks of goods available for sale to units of capacity such as seats on an airplane. Inventory represents the fixed amount of capacity available to provide goods or services.

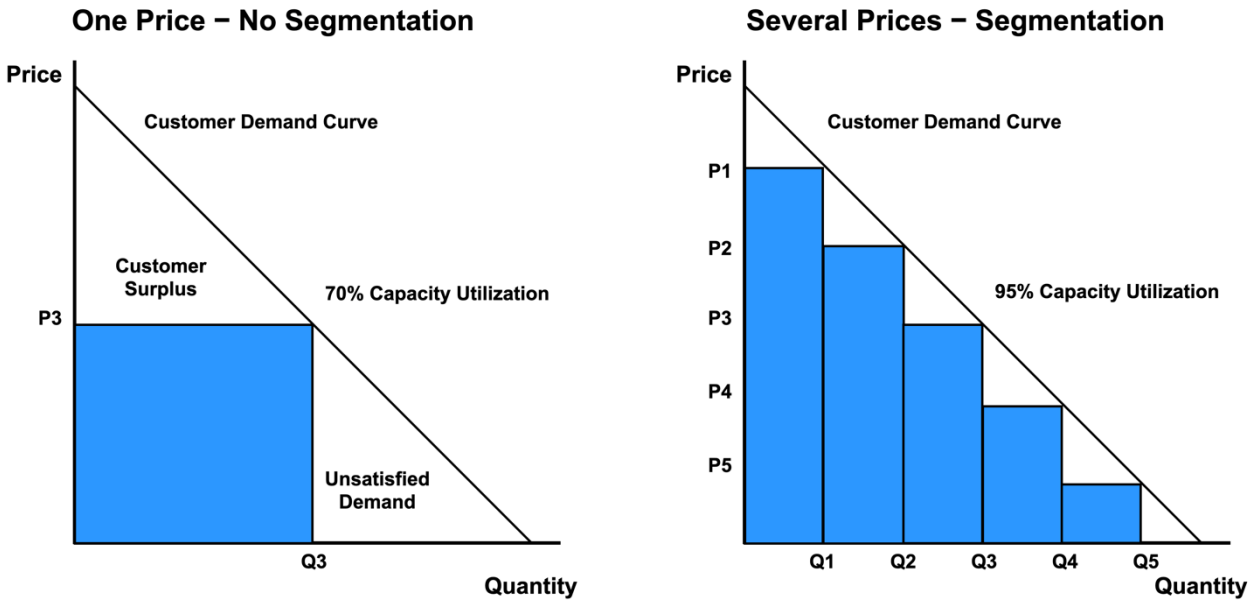
These circumstances for yield management are particularly critical for companies with high operating leverage (i.e., high ratios of fixed costs to variable costs) operating in competitive markets where demand outstrips supply. As a result, yield management techniques have migrated into other industries with similar market and firm structure characteristics, such as hotels, car rentals, railways, ride sharing, advertising, and recreational (e.g., ski) resorts. Industry 4.0 and the digital economy, which emphasizes high operating leverage cost structures, is expanding these opportunities. For example, the integration of products, sensors, the Internet of Things, and advanced analytics provides manufacturers the ability to reconfigure the sale of traditional tangible products into the sale of a service that includes predictive maintenance, continuous performance improvement, and quality guarantees.

For many if not most organizations, the yield management approach to revenue has focused on optimizing the sale of goods and services to customers at various price points depending on demand and shifting inventory availability. Figure 2 illustrates how various price points can be used to both optimize revenue and optimize capacity utilization. In the graph on the left-hand side, only one price is charged by a business and only customers willing to pay that price (or higher) will purchase the product. This results in unsatisfied customer demand from customers who want the product but not at the price offered and a consumer surplus for

[6] Anthony W. Donovan, "Yield Management in the Airline Industry," *Journal of Aviation/Aerospace Education & Research*, Spring 2005, pp. 11-19.

customers who would have paid a higher price. Further, the business has unutilized capacity as demand at the single price is less than total capacity. Yield management solutions increase revenue using customer segmentation, which is crucial. If the business can segment its customers by charging prices aligned to each segment's willingness to pay, as shown on the right-hand side of Figure 2, then it may be able to better utilize its capacity and capture the consumer surplus.

Figure 2: Customer Segmentation and Multiple Price Points



Adapted from William Maguire and Paul Rouse, *Revenue and Cost Management for Service Organisations*, second edition, Pearson Education New Zealand Limited, Auckland,New Zealand, 2006.

Yet given the characteristics that define yield management practice, this view actually limits the development of more robust revenue management practices that can apply to all types of business settings. By expanding on the foundation of yield management, this monograph provides a framework for revenue management that reflects the complexity of revenue generation in all industries and markets.

Demand management incorporates well-established yield management practices to optimize the average selling price and capacity utilization attained using customer segmentation, with a view to serving the most profitable mix of customers. Demand management helps maximize revenue from a business's fixed capacity. This approach requires organizations to segment customers around their willingness to pay according to their respective needs and value placed on the service attributes provided by the product or service. That is, service is the key objective, even for tangible products that are regarded as distributors of service.[7]

[7] This idea is from the theories of Service-Dominant Logic, which views all goods and services in terms of the services valued by individual customers (Stephen L. Vargo and Robert Lusch, "Evolving to a New Dominant Logic for Marketing," *Journal of Marketing*, January 2004, pp. 1-17). For example, different customers could

Pricing basis and inventory allocation practices are the two main levers for demand management. When supplemented by resource management levers (product configuration and duration control), pricing basis practices and inventory allocation practices can be applied to revenue strategy work for all kinds of organizations.

Pricing basis practices determine the extent of differential pricing in a business. By determining how and when different prices are charged to different customer groups, organizations employ this revenue management lever optimally to provide service as customers express their demand by their willingness to pay.

Inventory allocation practices determine how a business matches its inventory of productive resource capability with customer demand. The definition of inventory here comes from yield management, which incorporates both the traditional concept of goods available for sale and the concept in services industries regarding units of capacity to serve customer demand. Inventory allocation practices work in tandem with pricing basis practices to manage product availability depending on customer demand.

Resource management encompasses the practices used to manage the products and business processes needed to serve customer segments. Resource management systems facilitate demand management systems. Special emphasis is placed on reducing the resource requirements and process variation needed to achieve customer segmentation. Product configuration practices and duration control practices are the two main levers for resource management.

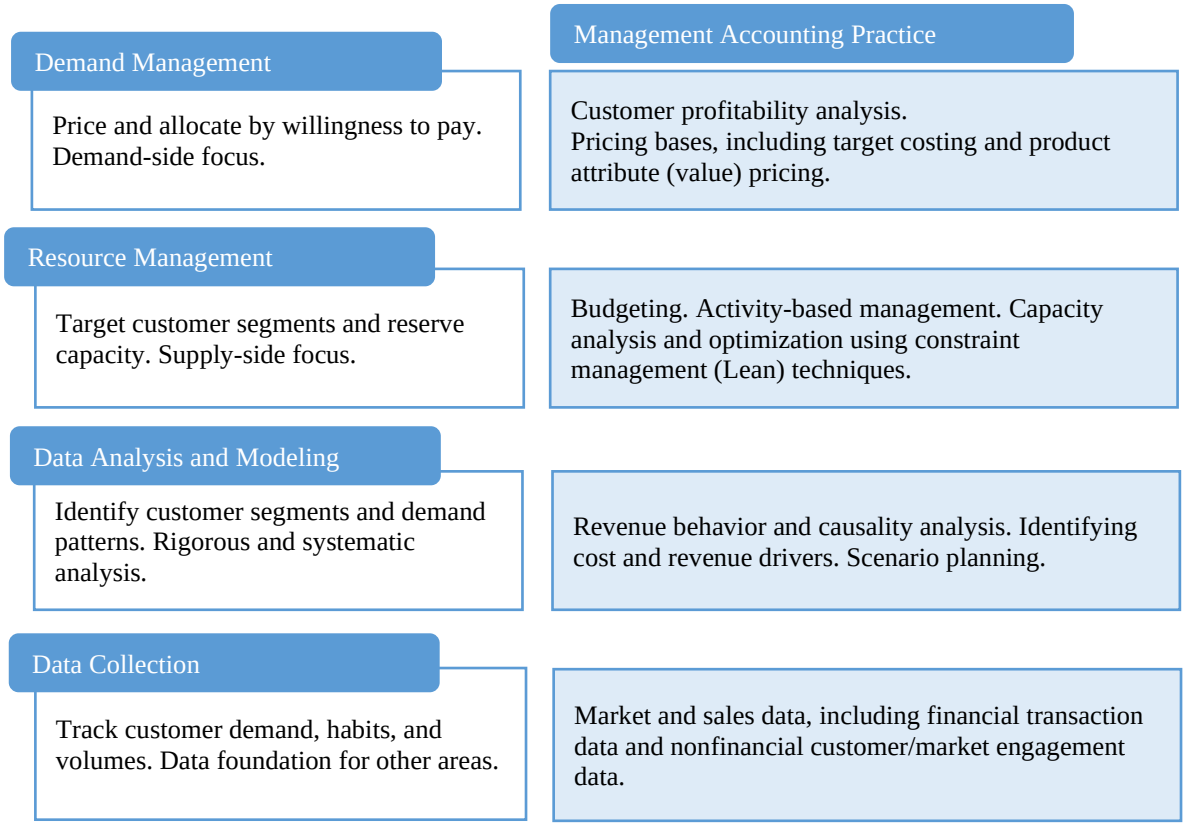
Product configuration practices determine the extent of product differentiation in a business. Organizations generally experience constant pressure to tailor the features of the service or product usefulness, or fulfillment and delivery features of the service or product, for individual customers. Product configuration practices focus on targeting and controlling customization of the service or product to segments of customers based on demand management needs (i.e., pricing basis practices and inventory allocation practices).

Duration control practices determine how product or service duration is managed in a business; in other words, how the total time and variation in time is managed for a particular product or service. Organizations often experience variability in how long it takes to serve different types of customers. Duration control practices are designed to manage both the overall time taken and the variability in time to serve. These practices can increase the number of customers that can be served for a fixed level of capacity.

The defining characteristics of revenue management relate to how a business manages its customer demand and its limited resources. Together, demand management and resource management enable businesses to focus on improving overall profitability. Demand management and resource management require management accounting systems that support relevant data collection, data analysis, and modeling. Table 2 provides an overview of revenue management practices and how they can be supported by related management accounting concepts, techniques, and tools.

value the services of an electric drill for different reasons such as compatibility with other electric tools, ease of use, or durability. For convenience, “product” can refer to both goods and services.

Table 2: Revenue Management and Potential Management Accounting Interface



Adapted from Frederick Ng, Julie Harrison, and Chris Akroyd, "A revenue management perspective of management accounting practice in small businesses," *Meditari Accountancy Research*, November 2013, pp. 92-116.

Table 2 illustrates that the revenue management perspective offers a generalizable lens that brings together the individual techniques used to grow revenue. Researchers highlight the synergies between revenue management and management accounting.[8] Yet, despite the growing popularity of revenue management practice in industry, this area remains relatively

[8] Michael Bromwich, "Thoughts on Management Accounting and Strategy," *Pacific Accounting Review*, January 1999, pp. 41-48; Ronald J. Huefner, "A Guide to Integrating Revenue Management and Capacity Analysis," *Management Accounting Quarterly*, Fall 2011, pp. 40-46; Ronald J. Huefner and James A. Largay, "The role of accounting information in revenue management," *Business Horizons*, May-June 2008, pp. 245-255; Frederick Ng, Julie Harrison, and Chris Akroyd, "A revenue management perspective of management accounting practice in small businesses," *Meditari Accountancy Research*, November 2013, pp. 92-116.

unexplored within management accounting.[9] By breaking down systems of practice into component parts, a revenue management perspective provides insight on sets of activities that might otherwise be viewed as disparate (for larger organizations) or simple (for small organizations).

As Industry 4.0 expands into Service 4.0, both manufacturing and service companies are evolving to create sustainable business solutions capable of mass customization to individual customer needs. New thinking about revenue management is necessary to maximize revenue and profitability in this highly automated and flexible environment.[10]

Assessing Your Current Revenue Management Practices

The starting point for improving revenue management in the organization is understanding current business practices being used to manage customer demand (practices designed to increase revenue) and resources (practices designed to improve the use of resources). Different intensities of revenue management practice will be appropriate depending on the business and the environment in which the organization operates. Table 3 provides a framework describing different intensities of revenue management practice. Higher intensity of practice is more complex and resource-intensive but may have potentially greater impact on profitability. Accordingly, higher-intensity practices are more likely to be employed by large organizations that have greater resources and operate in highly competitive markets.

Table 3: Framework of Revenue Management Practices

Revenue Management Practice	Lower Intensity (Level 1)	(Level 2)	(Level 3)	Higher Intensity (Level 4)
Pricing basis	**Resource-focused**			**Customer needs-focused**
	Pricing is primarily cost-plus or following not-for-profit objectives.	Pricing follows market standard prices. Limited variation in prices among different groups or area trends.	Pricing is strategic, aimed at a price point relative to the market. Pricing captures differences among groups or area trends.	Pricing is based on the value of specific product attributes. It captures differences among customer segments.
Inventory allocation	**Ad hoc**			**Systematic**
	No change or infrequent changes in price and customer priorities, often informed by unstructured judgment.	A fixed schedule determines how prices and priorities change over the year. These are across-the-board changes.	Periodic review to inform price and priority changes. Changes target groups of products and broad time periods.	Constant review to inform price and priority changes. Changes target individual products and specific time periods.

[9] Huefner, 2011; Paul Rouse, William Maguire, and Julie Harrison, *Revenue Management in Service Organizations*, Business Expert Press, New York, N.Y., 2010.

[10] Paul Juras and Lauren Johnson, "The Path to Industry 4.0 Implementation," *Strategic Finance*, June 2020, pp. 26-33, sfmagazine.com/post-entry/june-2020-the-path-to-industry-4-0-implementation.

Product configuration	**Physical differences**			**Nonphysical differences**
	Offerings are made using diverse inputs and processes. Product range does not aim to segment customers.	Offerings vary in either inputs or processes. Radical new products are introduced as tactical responses.	Offerings are built from a set of core inputs and processes. Occasional use of radical new products. Product range is structured around add-ons.	New products are regularly created using existing core inputs and processes. Product range is structured around restrictions and add-ons.
Duration control	**Reactive improvements**			**Stabilizing usage**
	Initiatives target overall improvement or to speed up internal processes as problems arise without focusing on reducing customer variation.	Initiatives detect and alleviate bottlenecks. The focus is on internal activity, with indirect effects on reducing customer variation.	Initiatives actively mitigate the internal effect of customer variation. There is limited focus on changing customer behavior.	Initiatives regulate customer arrivals and discourage bespoke requests with a strong focus on changing customer behavior.

The framework in Table 3 applies across different business models, industry settings, and organizational structures. The scales (from lower to higher intensity) shown provide a comparative view on how organizations choose to engage in management processes within each of the four revenue management practices (levers). Each practice is anchored at two ends of a continuum representing the "intensity" of revenue management. Higher intensity of practice is not always best. Managers must consider their strategy and resources with respect to their customers and competition in order to determine their "ideal" level of practice for each revenue management lever.

Barriers to higher-intensity practices are determined by company structure, and usefulness of higher-intensity practices is established by market conditions. Each organization must conduct its own analysis of strategic alignment and cost-benefit computations to determine its ideal combination of intensities across these four levers. To illustrate this analysis, we provide examples of three companies in the Appendix.

Improving Your Current Revenue Management Practices

The four key levers of revenue management practice can be used to improve a business's revenue management processes. Each lever provides levels of sophistication from relatively low-cost activities usable by all businesses to activities requiring higher levels of investment.

Adopting higher intensities of pricing basis practices

Table 4 describes pricing basis practices that determine the degree of differential pricing in an organization. Differential pricing involves charging different prices for products or services based on what different customer segments are willing to pay. This assists in maximizing the revenue from each individual customer. In a resource-focused business (e.g., a stand-alone restaurant), there is relatively little differential pricing with only ad hoc price changes. In a customer needs-focused business (e.g., a hotel chain), differential pricing is implemented either by varying individual attributes of products and services provided or by varying the price charged based on customer characteristics.

Table 4: Pricing Basis Practices

Resource-Focused (Level 1)	⟷		Customer Needs-Focused (Level 4)
Pricing is primarily cost-plus or following not-for-profit objectives.	Pricing follows market standard prices. Limited variation in prices among different groups or area trends.	Pricing is strategically aimed at a price point relative to the market. Pricing captures differences among groups or area trends.	Pricing is based on the value of specific product attributes. It captures differences among individual customer segments.
Cost-plus • Labor, materials, overhead • Manufacturer's suggested retail price *Fixed prices* • Set and forget *Ad hoc goals* • Reaching a one-off target • Sustainability	*Seasonal pricing* • Winter vs. summer • Public holidays • Artist is touring *Matching competitors* • Follow market rate • Recession-adjusted *Product popularity* • Prices up if sales are high • Quality level	*Differential pricing* • Time/day part • Different channels • Zone pricing *Group attributes* • New target market • Corporate rates *Strategic* • Lead-in prices • Customer psychology	*Individual attributes* • Pay for features • Terms and conditions • Advance bookings *Eliciting willingness to pay* • Dutch auctions • Negotiation • Customer elasticity • "Tall" price range • Dynamic pricing

From a revenue management perspective, the better pricing bases set prices according to the willingness to pay expressed by specific customer segments.[11] Hence, techniques that get the business closer to achieving individual optimal pricing reflect higher intensities of revenue management practice. Examples of customer-needs pricing can be found at the individual customer level. Dutch auctions and payment for additional features represent pricing at the individual customer level.[12] Examples of customer-needs pricing at the customer group level include corporate rates, pricing by regional zone, and pricing to target new markets.

Practices that approach the resourced-focused level include competitor-based pricing, which only indirectly captures customer willingness to pay through the value of alternative products but is not driven by costing decisions. Examples include simple price matching and strategic responses. Cost-based pricing is least likely to achieve the goal of pricing by customer attributes as product cost is an imperfect proxy for the value provided to customers. Ad hoc goals that do not capture customer willingness to pay or are not aimed at improving ongoing revenue generation also indicate lower intensity of practice.

Adopting higher intensities of inventory allocation practices

Table 5 describes inventory allocation practices that determine how a business shifts inventory availability to match changes in demand. This can be achieved by reserving

[11] Irene C.L. Ng, *The Pricing and Revenue Management of Services*, Routledge, Abingdon, United Kingdom, 2008.

[12] A Dutch auction is one of several similar types of auctions for buying or selling goods. Most commonly, a Dutch auction begins with a high asking price and lowers the price until some participant accepts the price or it reaches a predetermined reserve price.

product and service capacity for more profitable customer segments or by changing prices to manage demand levels. This assists in maximizing the revenue earned from a limited supply of products or services by prioritizing the most profitable customers. In a business using ad hoc inventory allocation, there are either limited changes in allocations during the period or changes occur in an unstructured way. In a business using systematic inventory allocation, there is frequent monitoring of inventory utilization with dynamic adjustments made based on sophisticated modeling of customer demand.

Table 5: Inventory Allocation Practices

Ad Hoc (Level 1)	← →		**Systematic (Level 4)**
No change or infrequent changes in price and customer priorities, often informed by unstructured judgment.	A fixed schedule determines how prices and priorities change over the year. These are across-the-board changes.	Periodic review to inform price and priority changes. Changes target groups of products and broad time periods.	Constant review to inform price and priority changes. Changes target individual products and specific time periods.
No priorities or price changes • Fixed from start of year • Inventory available to everyone *Unstructured changes* • Irregular demand checks • Discount by customer attitude • Case-by-case judgment *Other objectives emphasized* • First come, first served • Customer goodwill	*Seasonal changes* • Peak and low rates • By events *Across-the-board changes* • Increase/decrease capacity • Nationwide promotion *After-problem response* • Turning customers away • Dumping excess stock *One-off studies* • Structure often overridden	*Specific changes* • By individual product • Shop-level promotions *Ongoing structured system* • Regular review • Formulaic decisions *Restrictions when busy* • Close off cheaper products • Peak period surcharge *Strategic sales mix* • High price on definite sales • Randomize tactical action	*Constant review* • Daily review *Model-based* • Built from forecasts • Analysts only adjust parameters *Dynamic rules* • Adjusts by circumstances • Appropriate size movements

Inventory allocation practices encompass approaches used by organizations to respond to demand trends, manage the release of inventory, and apply manager judgment. Differences in the level of sophistication reflect the granularity of change (capturing specificity and frequency of changes) and the structure of the change (ad hoc vs. formalized decision making).

Businesses with greater information about customer demand can perform at higher intensity of revenue management when making inventory decisions. Those that adjust specific portions of their inventory in response to shorter periods of variation have more sophisticated systems than those that implement across-the-board changes.[13] For example, increases in the frequency of change (from annual change to hourly change) can be applied over increasingly specific portions of inventory (from broad, network changes to changes applied to individual products or services).

[13] Sheryl E. Kimes and Richard B. Chase, "The Strategic Levers of Yield Management," *Journal of Services Research*, November 1998, pp. 156-166.

Higher intensity of inventory allocation is also found in businesses that use structured approaches, such as analytical models or rule-based approaches, with continuous review.[14] Relying solely on irregular manager actions runs a risk of observation bias, where managers respond to noise rather than underlying trends or ignore certain key indicators.[15] For example, businesses with higher intensity of inventory allocation practices are likely to have a higher commitment to structured observation and decision making. Lower-intensity inventory allocation practices are likely to rely on unstructured observations by managers to identify future shocks or capture ad hoc changes in customer willingness to pay. In contrast to this reliance on human experience, more systematic models use formalized structures, systems, and data collection and analyses to detect the need for change and to determine the amount of change required. These are included as parameters in analytical models of demand where structured analysis or revenue management software helps determine the appropriate decisions and priorities.

Adopting higher intensities of product configuration practices

Table 6 describes product configuration practices that determine the extent of product differentiation in a business. Product differentiation is the practice of designing the product or service range to target different customer segments. This practice assists in the use of differential pricing and yield controls that discourage customers from buying a cheaper product.

Many businesses use physical distinctions and processes to differentiate products or services in the marketplace, which results in the need for different resources to support the product. Conversely, a business using nonphysical distinctions to differentiate products or services that are physically similar may do so by varying terms of sale or distribution channels. Accordingly, the resources used in these businesses are usually the same for all products or services.

[14] Charles W. Chase, "Revenue management: A review," *The Journal of Business Forecasting Methods & Systems,* 1999, pp. 2, 28-30.

[15] Kalyan T. Talluri and Garrett van Ryzin, *The Theory and Practice of Revenue Management*, Springer Science & Business Media Inc., New York, N.Y., 2004.

Table 6: Product Configuration Practices

Physical Differences (Level 1) ⟷			**Nonphysical Differences (Level 4)**
Offerings are made using diverse inputs and processes. Product range does not aim to segment customers.	Offerings vary in either inputs or processes. Radical new products are introduced as tactical responses.	Offerings are built from a set of core inputs and processes. Occasional use of radical new products. Product range is structured around add-ons.	New products are regularly created using existing core inputs and processes. Product range is structured around restrictions and add-ons.
Inputs radically differ • Different facilities/equipment • Varying processing costs *Not to segment customers* • Artisan or historical focus • Only one product • Medical or humanitarian need *Unusual products* • Limited-run item • Sourced from second-hand	*Same input, different process* • Common components • Effort or skill differs *Customization on request* • Bespoke product • Ancillary services *Products as tactical responses* • Novelty effect • To match competitors *Using inherent differences* • Location of delivery	*Same input, same process* • Flexible product configuration • Restrict product offerings when busy *Incremental additions* • Add-ons for products • Ancillary retail sales *"Outsource" cost of variation* • One-stop suppliers • Small order batches	*Identical resources* • Only administration costs differ between products • Differences in how price variations are formed *Imposing restrictions* • Terms and conditions • Pitching same product differently • Limits on usage *Enabling segmentation* • Membership plans • Different channels

From a revenue management perspective, the goal of providing multiple products is to segment the customer base and facilitate differential pricing.[16] Differences in product configuration arise from an understanding of customer segmentation and whether differences are created by using physical vs. nonphysical characteristics. Higher intensities of product configuration practice exist where there are significant differences in the menu of products and services available to respond to a more sophisticated segmentation of customers. It is crucial that customer groups are able to understand these differences and that the differences are aligned with their willingness to pay.

Physical characteristics refer to the use of different input processes. In a hotel setting, examples of physical characteristics include different bed configurations, different room sizes, or different views (e.g., lake vs. street) from the rooms. Using different physical characteristics to configure products or services affects resources and is likely to be a more expensive way of achieving customer segmentation. Using nonphysical characteristics to configure products or services generally has fewer resource implications, but there is a risk in some cases that customers will not understand why they are being charged different prices. Examples of nonphysical characteristics are airline ticket terms and conditions or a restaurant offering happy hour discounts on the same meal items on the menu.

Adopting higher intensities of duration control practices

Table 7 describes practices that determine how duration controls are used in a business. Duration control is the approach to manage the time taken (overall time and variation in time) to provide a product or service to a customer. Duration control supports the use of differential pricing and yield controls by making customers more predictable. It also helps to increase the

[16] Talluri and van Ryzin, 2004.

number of customers that can be served by a business. Where a business relies on reactive improvements, duration controls only change in response to external events or when the business redesigns its systems. Accordingly, improvements tend to occur infrequently or on an ad hoc basis. In businesses that seek to stabilize usage, duration controls are specifically designed to change customer behavior in order to reduce variation in the time it takes to serve customers.

Table 7: Duration Control Practices

Reactive Improvements (Level 1)	⟷		**Stabilizing Usage (Level 4)**
Initiatives target overall improvement or to speed up internal processes as problems arise without focusing on reducing customer variation.	Initiatives detect and alleviate bottlenecks. The focus is on internal activity, with indirect effects on reducing customer variation.	Initiatives actively mitigate the internal effect of customer variation. There is limited focus on changing customer behavior.	Initiatives regulate customer arrivals and discourage bespoke requests with a strong focus on changing customer behavior.
Focus on entire process • Adding more staff *Fighting fires* • Expediting late production • Ad hoc policies introduced *Resigned to variation* • Growing product range • Business model relies on variance	*Focus on bottlenecks* • Manager paces production • Reengineering • Prioritize valued customers *Static guidelines* • Even if industry shifts • Always upsell *Problem detection systems* • Benchmarking processes • Measuring service time	*Stabilize with business controls* • Restricting product range • One-stop-shop suppliers • Overbooking *Formal policies* • Process guidelines • Formulaic controls • Regularly reviewed *Policies differ in busy periods* • Busy vs. slow procedures • Different menus of products or services	*Stabilize with customer controls* • Change customer behavior • Minimize bespoke orders • Cancellation penalties • Late checkout fee • Encourage advance orders *Minimize on-shift interaction* • Self-service processing • Advance order taking

The revenue management literature identifies that variation in customer behavior is problematic as it makes it difficult to accurately predict and anticipate customer behavior.[17] It requires a focus on finding root causes of variation in a business process rather than simply implementing ad hoc improvements.[18]

At the lower intensity of practice are reactive improvements that do not necessarily manage underlying causes of variation. For example, during times of high demand, a business may speed up an entire process rather than change the subset of activities needed to meet the higher demand. Similarly, time-consuming upselling might be used at all times, rather than just during periods of low demand. These practices reflect a "fighting fires" approach. During busy periods, managers can expedite slow orders or schedule additional staff as needed, but these are reactive improvements rather than curing the root cause of varied customer behavior.

[17] Sheryl E. Kimes, Deborah I. Barrash, and John E. Alexander, "Developing a Restaurant Revenue-management Strategy," *Cornell Hospitality Quarterly*, October 1, 1999, pp.18-29; Kimes and Chase, 1998.

[18] Eliyahu M. Goldratt, *The Goal*, second edition, North River Press, Croton on Hudson, N.Y., 1992; Kimes, Barrash, and Alexander, 1999.

Practices aimed at mitigating variation when creating products or services lead to improvements in duration control. For example, automated and advanced check-in procedures used by airlines and hotels can reduce variation in process times.

The highest intensity of duration control uses policies to stabilize customer behavior. Practices include introducing penalties for late customer arrivals and no-shows, simplifying the menu of products or services available to reduce customer time to order, and overbooking to offset no-shows. High intensity of duration control practices can actively stabilize customer behavior. In contrast, lower intensity of duration control treats the variation in customer behavior as unavoidable and focuses solely on managing business practices to mitigate the effect of varied customer behavior.

Aligning Revenue Management Practices with the Business Context

A key issue when expanding revenue management practices is to identify how a business's context affects the four levers of revenue management practices (described in Table 3). For many organizations, the classic yield management applications found in airlines and hotels do not seem to fit their business. Yet understanding the four levers discussed previously reveals that revenue management does not look the same in all settings. Instead, organizations should establish the appropriate levers of revenue management practice to fit their context.

This section discusses several contextual factors that should impact how organizations appropriately deploy revenue management levers. We organize these contextual factors by (1) industry and business model characteristics and (2) market environment and business structure characteristics.

Industry and Business Model Characteristics

Industry and business model characteristics arise from the type of product or service the organization delivers, which can be described in broad terms as "industry features" or "business model features." Traditional revenue (yield) management arose in airlines and hotels due to the ease of customer segmentation, capacity perishability, and varying demand.

Customer segmentation

Customer segmentation refers to the ability to distinguish between the needs of different market groups, depending on how much variation actually exists and is observable. When different customer segments are easily identified, organizations can specifically target their products or services to customer groups according to the customers' willingness to pay. When there is clear variation among customers, it is easier to design products and services to encourage customers who are willing to pay a higher price. For example, the needs of business travelers vs. leisure travelers are different in a number of aspects. Business travelers generally require flexible travel arrangements and are less price-sensitive. In contrast, leisure customers are willing to accept less flexible arrangements and are more price-sensitive. Hence, airline customer groups can be segmented using advance purchase requirements and conditions of sale (e.g., refund policies, availability of loyalty points, etc.).

Perishability

Perishability refers to whether resource capacity, or the products or services provided by the capacity, are sensitive to losing value over time. For example, manufacturing organizations are able to produce finished goods and store them in inventory. In contrast, service organizations generally have to deliver service at the time it is demanded. Hence, idle capacity is lost if not used. When capacity is highly perishable, inventory controls and pricing basis become more important. Therefore, organizations practicing revenue management should charge higher prices when demand is elevated and reduce prices when demand decreases and capacity would otherwise be wasted.

Varying demand

Demand often fluctuates more than supply due to seasonal trends, special events, or demand patterns that shift across time of day (e.g., lunchtime vs. dinnertime). In situations with high variability in demand, businesses have greater incentive to analyze trends and implement pricing basis and inventory allocation to maximize profitability during busy periods.

Additionally, duration controls become useful in reducing the time it takes to serve customers (thereby increasing capacity during busy periods) and reducing variation in customer use (which makes planning easier due to more predictable demand patterns).

Ability to charge varied prices

Revenue management is impacted by differences in customer willingness to pay varying prices. That said, managing revenue using the pricing basis lever may be hampered in particular settings where prices need to be consistent to stay competitive, such as for commodity goods or services. Yet many businesses miss revenue management opportunities by not recognizing or searching for creative pricing basis conditions in their market. This is the role of pricing basis and product configuration.

Predictable customer duration

Revenue management practices benefit from predictable customer duration. This predictability allows the business to plan and implement inventory allocation and to design product and service offerings to match customer needs and behavior. Some settings experience greater degrees of variability in how much time it takes to serve a customer, such as continuing care hospitals, golf courses, and consulting firms. In these settings, duration control practices help identify causes of variation and work with that variation to mitigate the negative impact on revenue and profit.

Market Environment and Business Structure Characteristics

Competitive environment

The sophistication of revenue management practices was originally driven by intense competition in airlines and hotels. More recently, pricing and product transparency due to internet technology, as well as the pressure of recessionary trends, has heightened competition in many businesses. As a result, businesses in competitive environments have responded by increasing the level of detail in their demand and resource analyses and introducing more frequent changes to pricing and inventory allocations. For example, responses to greater price sensitivity include introducing shorter booking windows and using more tactical promotions.

Scale of business

Industry research finds that improvements in revenue management are associated with 4%-7% improvements in revenue.[19] Yet complex revenue management practices require accuracy and precision in analysis used to inform decision making.

Larger organizations can practice higher-intensity levels because they have more resources available to invest in the required support systems. High sales volume levels also mean that the benefits of revenue management analysis can be leveraged over a greater number of transactions. The reality of larger organizations reflects economies of scale, where a fixed cost of conducting revenue management analysis benefits a bigger scale of operations. As a result, smaller organizations without access to significant resources may employ less-intensive levels of these techniques, and this is quite appropriate.

[19] E. Boyd, *The Future of Pricing: How Airline Ticket Pricing Has Inspired a Revolution*, Palgrave Macmillan, New York, N.Y., 2007; Chase, 1999.

For example, in a retail store environment, detailed analysis of customer demand and identification of demand predictors are valuable where businesses are buying and selling thousands of product or service units. In contrast, this level of analysis is unnecessary in small retail stores where managers can easily monitor daily sales activity without the need for sophisticated systems.

Growing and new organizations

When a business is rapidly growing or newly established, variation in customer behavior may be more difficult to detect due to a lack of established history and because the organization's systems are continually developing during this phase. While new processes are being established, unforeseen problems and other unexpected events may arise, leading to delays and even system failures, such as when clients give up in the queue and take their business elsewhere. Hence, failure to pay attention to appropriate duration controls until processes have been fully developed can lead to serious problems involving customer variation.

Formalized organizational structure

Formalized organizational structures are associated with structured analysis rather than intuitive analysis, with a focus on control and accountability.[20] Managers in more formal structures are likely required to prepare regular reports regarding prior performance and expected future trends. Hence, more formalized structures are likely to be used for demand management decisions and to oversee resource management.[21]

Functional organizational structure

Organizations with dedicated business functions, such as sales, marketing, production, and R&D, will have staff with expertise in analyzing and developing the various levers of revenue management. At the same time, having a range of business functions requires more coordination to ensure staff is making changes that support revenue management practice as opposed to other business objectives.

[20] Robert H. Chenhall, "Theorizing Contingencies in Management Control Systems Research," *Handbook of Management Accounting Research*, edited by Christopher S. Chapman, Anthony G. Hopwood, and Michael D. Shields, Elsevier, Amsterdam, The Netherlands, Oxford, United Kingdom, 2007.

[21] Arthur Andersen & Co., *Yield Management in Small and Medium-sized Enterprises in the Tourist Industry*, European Commission, Directorate-General XXIII, Brussels, 1997.

Revenue and Cost Drivers

Revenue and cost drivers refer to identifiable parts of business operations, such as service outcomes or activities, that explain the amount of revenue earned or cost incurred. Cost drivers are incorporated in many management accounting techniques to help measure resource use or describe how operations and objectives cause costs. The revenue management levers mentioned previously can also be interpreted from a revenue and cost driver perspective.

Revenue drivers and how they can be modeled in conjunction with established cost driver models are described in this section and show how revenue management thinking can be integrated with cost management and resource thinking.

Conceptual Model of Revenue and Cost

The guiding principle for cost driver modeling in the IMA CFMC is causality, which is fundamentally defined as the ability to reflect cause-and-effect relationships.[22] This same guiding principle applies to revenue driver modeling.

A useful revenue model must efficiently guide a manager in two ways to (1) show how a monetary effect is linked to the operational cause and (2) provide clear and direct insight into the probable monetary effect of a particular operational action (or cause) being considered. That is, organizations make monetary investments to create and capture revenue value, which in turn can be measured monetarily.

By applying the principle of causality and its associated concepts, we create an operational model that represents an organization's processes, and then collect financial information to inform the operational model. The resulting financial model will represent the causal relationships of strategic and operational impacts on costs or on revenue. In fact, when revenue drivers are modeled to demonstrate the causal relationship between operational inputs and operational outputs, then revenue drivers are also cost drivers in the organization.[23] The principle of causality in modeling revenue drivers establishes the baseline that managers use to optimally achieve their revenue strategy.

The design, implementation, and use of a revenue driver model must apply two principles—causality and analogy. Causality, as described above, deals with capturing and understanding quantitative cause-and-effect relationships in the organization. Analogy is concerned with applying causal information to optimize management decisions. That is, causal information describes interactions—how do parts of the business interact and what are the associated financial outcomes? Analogy refers to management decisions—given our understanding of causal interactions, what changes can we make to improve performance?

For example, two revenue drivers commonly associated with yield management are market segments with a diverse range of price points. The causal model should inform management of the impact on processes and resources to service each segment with a matching of the consequent effect to price points. This can then enable managers to evaluate profitability of

[22] White and Clinton, 2014.

[23] Note that while all revenue drivers also represent cost drivers in the organization, the reverse is not necessarily true: Not all cost drivers can be represented as revenue drivers.

segments and pricing strategies. This becomes especially pertinent if the decision-making problem concerns new market segments and new products or services.

The backbone of revenue management is an operational model composed of outputs and their required input (resource) quantities. A quantity-based causal revenue model directly connects the resources, products, and services about which managers make decisions. Money serves as a common denominator to compare diverse and often incomparable nonmonetary operational decision alternatives. This modeling approach supports managers' information needs in two ways:

1) Nonmonetarily, it presents a quantitative representation of relevant cause-and-effect relationships between resources, processes, and customer value attributes, and
2) Monetarily, it provides the financial valuation of the resource quantity relationships with revenue quantity.

Analogy fundamentally underlies all managerial decisions and actions. It forms a mechanism upon which valuable business experience can be gained and applied. Analogy can be applied by using the information from a revenue model built on operational cause-and-effect relationships. Such a causal model facilitates learning and decision making by providing for all managers clear, logical insights into the operational relationships and related monetary outcomes (both costs and revenues) of an organization.

Based on the CFMC, we lay out 12 concepts essential to establishing a causal revenue model that can be classified as follows:

1) *Managerial objectives*: Specific results or outcomes based on the application of resources that managers choose to employ for the purpose of deploying work activities that build or protect revenue.
2) *Resources*: The people, technology, inventory, and intellectual property that have been developed or employed by the organization. Resources are combined with work activities to establish revenue attributes.
3) *Work*: Resources engaged in specific work activities or processes to accomplish managerial objectives. The ability to model specific work activities and processes assists in optimizing the capacity of resources. Work activities, combined with resources, create attributes that may or may not be valued by customers.
4) *Attributes*: The service outcomes created by resources and work activities. Ideally, the application of resources and work activities should be valuable to customers.
5) *Revenue*: A monetary measure of the bundle of product or service outcomes provided to customers.
6) *Cost*: A monetary measure of (a) consuming a resource to achieve a managerial objective or (b) making a resource available and not using it.
7) *Homogeneity*: The characteristic of one or more resources that share a similarity that allows their managerial objectives and costs to be governed by the same set of determinants. For example, customers who share similar needs that are met by similar resources.
8) *Traceability*: The characteristic of a resource input that permits it to be observed and recorded with respect to its managerial objective or customer group (segmentation).
9) *Capacity*: The potential for a resource to do work that generates revenue and achieves managerial objectives. Knowledge of excess or idle capacity represents a significant optimization opportunity.

10) *Responsiveness*: The correlation between the output of managerial objectives and the input quantities of a particular resource. Responsiveness captures the essence of the cause-and-effect relationship.
11) *Attributability*: The concept of attributability guards against arbitrary decisions to quantitatively associate resources with specific revenue outputs when responsiveness cannot be observed. Instead of making arbitrary quantitative associations, revenue-related resources without clear connections to revenue outputs are assigned to business or organization levels based on control and responsibility factors.
12) *Integrated data orientation*: Information about an organization's economic resources, events, and their corresponding monetary values that allows for the aggregation of elementary data elements and their values for any purpose. Managerial accounting depends on integrated operational and financial data sources that can be consistently stored for access and retrieval throughout the organization, independent of the general ledger.

Note that *managerial objectives* and *resources* form the constructs that make up the organization's revenue model. *Revenue, cost, homogeneity, capacity, work, and attributes* describe the characteristics of the constructs, while *responsiveness* and *attributability* describe the relationships between the constructs and *integrated data orientation* denotes the nature of high-quality information in the revenue model.

The CFMC also establishes four characteristics that are critical to using the causal revenue model as an analogy for managerial decisions and actions. These concepts are briefly described below.

1) *Avoidability*: Resources that can be eliminated (within a reasonable time period) as a result of a decision demonstrate the characteristic of avoidability.
2) *Divisibility*: Resource volumes that are associated with change in the volume or nature of a managerial objective's output demonstrate the characteristic of divisibility.
3) *Interdependence*: More or less interdependence exists in the organization's revenue model to the extent that decisions involving multiple managerial objectives affect the amount or quality of resources available for one managerial objective vs. another.
4) *Interchangeability*: As the organization's resources have the capability to be deployed in multiple managerial objectives, the revenue model demonstrates increasing interchangeability.

With respect to these revenue model characteristics that describe usefulness for management actions, note that *avoidability* and *divisibility* are primarily relevant to analysis activities, while *interdependence* and *interchangeability* relate primarily to decision making.

Focusing on revenue and cost relationships relevant for revenue management, Figure 3 presents a framework that illustrates the character of revenue drivers and draws a connection between revenue drivers and cost drivers.

Figure 3: Revenue Driver Framework

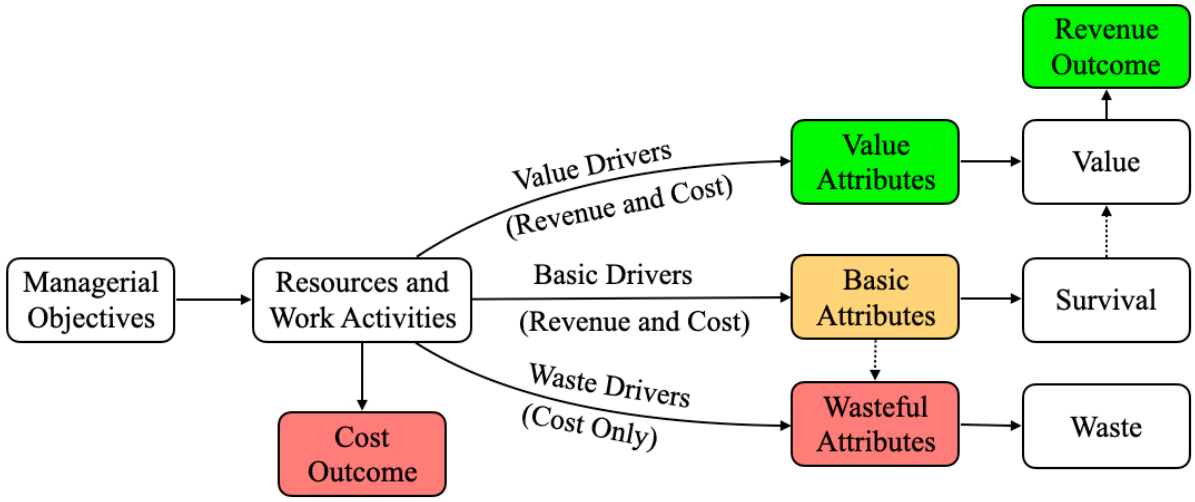


Figure 3 shows that revenue and cost are connected through resources and work activities that are used to deliver goods and services to customer segments. Based on managerial objectives, organizations acquire resources and generate work activity with the goal of delivering value and achieving revenue objectives. All work activities in an organization require resources.[24] Examples of resources include buildings, equipment, labor, inventory, and management.

Attributes determine how resources and work link value to the customer. These are features of the product that customers value, determining customer willingness to pay. Examples of attributes include the final outcome of the product (e.g., one night's accommodation), features of the product (e.g., quality or novelty), and the method of delivery (e.g., convenience, speed of delivery, and friendliness of staff). Service is a defining characteristic of attributes that directly drive customer value, influencing the revenue earned.[25] Together, resources and work activity create revenue based on the value of attributes they produce. That said, it is important to understand that when deciding whether to buy a product, customers assess the attributes they will receive from the product or service (e.g., one night's accommodation), rather than valuing the resources and work activities used by the business (e.g., cleaning the accommodation). The role of resources and work activity in driving revenue is in creating the final attributes. Staff training, for example, can improve the quality of product and delivery method, yet it only adds value through the outcomes it produces for the customer's use.

Customers buy products because of attributes they value and are willing to pay for, thus generating revenue for the business. Resources and activities that combine to create value attributes for a hotel customer, for example, may involve upgraded mattresses, surround-

[24] This is a self-evident assumption that businesses cannot produce positive output with zero input, i.e., there is no free lunch. Conversely, a business can incur cost with zero output; Robert S. Kaplan, "Introduction to Activity-Based Costing, *Harvard Business School Background Note 197-076*, revised July 2001 from February 1997, pp. 1-14.

[25] Vargo and Lusch, 2004.

sound music systems, high-quality room cleaning, and airport transfer service. For manufacturing and retail customers, value attributes often involve innovative product features, product durability, and service after sale.

Resources and work activities are also critical to providing basic attributes that, while essential, do not directly increase revenue. In a hotel business, basic resources and activities may include a parking lot and online invoicing. Customers are frustrated if these basic attributes are not provided, but they do not value these attributes to the point of factoring them into how often they book rooms or how much they expect to pay for a hotel room. Similarly, resources and activities involved in product order fulfillment, for example, are essential but typically not value-adding for the manufacturing or retail customer.

Organizations are constantly battling the problem of resources and work being spent on nonvalue-adding attributes that only produce waste or, worse, frustration for the customer. Misunderstanding customer needs and failure to segment markets can result in delivering attributes that would have no impact on buying or paying more (in contrast to value attributes) or any impact on the decision to purchase if the attribute was removed (in contrast to basic attributes). Quality, delivery time, and product functions that are surplus to customer expectations can incur costs without an increase in customer value. Of course, low-quality and ill-timed resources and work activities will negatively impact customers, causing revenues to decline. Attributes that have no or a negative impact on revenue are waste drivers in the organization.

Figure 3 illustrates the connection that resources and work activities have with costs and demonstrates that connection in relationship to revenue. All initiatives to improve or sustain revenue require resources and work activities to produce value attributes and basic attributes that drive revenue and that drive costs. Cost drivers can involve direct expenditures or the opportunity cost of resources already acquired and activities already put in place. In other words, cost drivers do not always mean that costs will increase. Instead, cost drivers can explain the amount of cost already incurred.

Not all cost drivers are revenue drivers. More resources and activities increase revenue only by increasing the value a customer receives from the product. Accordingly, only resources and work activities that offer value or basic attributes are revenue drivers. Resources and work activities leading to waste attributes should be reduced and the related cost drivers removed from the organization. Another source of costs in the organization that are not related to revenue attributes are the opportunity costs of idle resources (i.e., excess capacity). Idle resources create costs that do not contribute directly to revenue attributes, but idle resources are not necessarily a wasteful attribute in the organization. Idle resources may result from issues involving market demand, management policy, legal requirements, or contractual expectations. If the idle capacity is excessive, then the attending cost is wasteful. On the other hand, if the capacity represents opportunities for flexibility, customization, speed, or development, then idle resources put the organization in a position to create more value attributes. Hence, idle resources can be a potential source of revenue.

Identifying Revenue and Cost Drivers

The revenue model highlights that revenue drivers and cost drivers are connected through resources and work activities. Decision making must simultaneously examine both revenue drivers and cost drivers. This reflects the core focus of businesses on profitable ROI as the ultimate objective and not separately on the revenue and cost components. The absence of a balanced perspective has the potential for dysfunctional decision making, which can harm

overall profitability. Resources and work activities engaged to increase revenue also incur costs, and this combination determines the final profitability of the business.

A key exercise to align management accounting information with revenue management practice is to identify the central revenue and cost drivers in your business. Table 8 provides examples of drivers associated with the levers of revenue management and illustrations of the impact they can have on revenue and cost. The descriptions are designed to apply broadly and trigger discussions in your organization. The examples, likewise, are chosen to provide illustrations from a variety of settings and are not meant to be a comprehensive list.

You can evaluate the importance of each driver in your organization, making sure to identify any new important drivers arising from changes in revenue management practices. You can work with other business functions to model the interactions among drivers with the principles of causality and analogy and find gaps where further management accounting information is needed.

Table 8: Examples of Revenue and Cost Drivers

Pricing Basis Drivers	**Description**	**Driver Example**	**Revenue Impact**	**Cost Impact**
Price points	Diversity of price points served by products/services	Dynamic sales system that enables different prices based on the time of day	Higher prices for time periods of high demand	Higher investment in flexible-response monitoring systems
Special events	Special events that generate increased customer demand	Holiday promotion event offering discount prices	Increased customer demand during the event	Higher operating costs in promoting and running the event
Brand image	Reputation of products/services and organization in the market	Marketing for high-quality products/services	Increased customer demand at higher price points	Increased advertising and quality control costs
Market share	A bigger market share with a greater presence in size and scope	Targeted marketing campaigns to different customer segments	Greater customer awareness of the company's service offerings	Increased marketing costs to preserve and enhance market position
Inventory Allocation Drivers	**Description**	**Driver Example**	**Revenue Impact**	**Cost Impact**
Customer loyalty	Ability to engage and retain existing customers	Training program for frontline employees	Improved customer experience	Increased training costs
Range of customer segments	Serving a diverse range of customer segments	Number of distinct customer groups	Better matching of capacity to customer groups	Higher customer relationship management (CRM) costs
Location of service centers	Being located close to target customers	Main street location	Increased foot traffic	Higher rent
Scale of service	Size of organization and total capacity of production processes	Workforce size and diversity	Increased capacity and capability available for sale	Diseconomies of scale from complexity and monitoring
Product/service range	Diversity of product/service range offered to customers	Number of available product features	Greater flexibility in meeting customer demand	Drives cost through product management needs

Product Configuration Drivers	**Description**	**Driver Example**	**Revenue Impact**	**Cost Impact**
Specialized technology or activities	Technology or activities designed for the production of specialized products or services	Advanced manufacturing equipment used to customize customer products	Higher prices for customized service	Higher investment and operating costs for advanced technology
Close B2B and B2C relationships	Supply chain relationships and customer relationships	Investment in new CRM system to track customer demand patterns	Better matching of production to demand patterns	Higher investment and operating costs
Employee skill and experience	Capability of employees to produce different goods and services	Training employees to produce multiple goods and services	Increased employee flexibility to address customer demand shifts	Increased training costs
Total quality management	The level and consistency of product/service standard	Six Sigma-quality programs in design or production	Increased customer propensity to recommend the product or brand	Increased design review and production control costs
New products/ services	Level and frequency of product or service innovation	Product innovation rate	Increased version rollouts that target value attributes	Additional information costs in educating consumers
Duration Control Drivers	**Description**	**Driver Example**	**Revenue Impact**	**Cost Impact**
Production/service efficiency	The speed with which inputs are converted into product and service outputs	Implementation of new technologies	Increased capacity in time and scope	Higher investment in training and technology
Service lead time	Speed of response to a customer order	Improved processes to increase speed of service delivery	Reduced lead time and variability in response time	Higher training costs incurred for new process designs
Product/service design	Level of complexity of production	Design for manufacture (DFM)	Enhances product/service reliability and functionality	Higher product design cost; offset by cheaper production costs
Capacity utilization	Enabling capacity potential	Incentivizing flexible work schedules	Better matching of capacity to customer demand patterns	Higher coordination and communication costs

Data Analytics to Support Revenue Management

Data Practice Intensity

To improve revenue management practices, organizations need to examine the types of data collected, the method used to collect data, and how data are analyzed. Table 9 describes the intensity of data practice used across a spectrum of practice. Lower intensity of practice involves limited record keeping, experience-based collection methods (such as on-the-job observation or anecdotal evidence), and intuitive analysis. Higher intensity of practice involves continuous data collection that is broad in nature, specific to particular revenue management techniques, and reliant on sophisticated computational models that support complex revenue management approaches. In general, higher intensity of revenue management practice requires higher intensity of data analytics.

More intense data analytics can help detect patterns in demand, incorporate a broad range of internal and external information, and improve confidence in decision making.

Table 9: Spectrum of Data Practices

Data Analytics	Lower Intensity (Level 1)	(Level 2)	(Level 3)	Higher Intensity (Level 4)
Collection method	**Experience-based**			**Continuous**
	Data collection relies on on-the-job observation and casual feedback. Records are updated manually and limited to transaction data.	Point-of-sale systems capture a range of transaction details. Some research into trends but it is infrequent or only for special projects.	Regular, documented research into customers and industry trends to complement automated transaction records.	Fully automated collection is used for internal and external data. Any manual research is structured for use alongside automated records.
Types of data	**Internal, aggregate**			**Broad-scope, specific**
	Record keeping is limited to internal activity. Data are highly aggregated and primarily for compliance or accountability.	Moderately aggregated transaction data. Some records are kept about customers and external environment but they are separate from transaction records.	Customer and product data are kept alongside individual transaction records. Broad range of external influences are recorded to help understand future trends.	Extensive internal and external information is recorded alongside transactions. Detailed records about competitor and environment activity.
Analytical approach	**Intuitive**			**Computational**
	Analysis is intuitive, relying predominantly on manager judgment and experience.	Analysis is mainly intuitive but informed by visualizations and comparisons. Ad hoc attention to revenue drivers.	Analysis blends intuition and formulaic techniques. Frameworks used to consider a range of revenue drivers.	Analysis relies on causality models, which systematically incorporate key revenue drivers.

The analytical approach, types of data, and collection methods are the three main areas of data practice. Analytical revenue management relies on statistical models investigating causality to understand customer demand. This helps detect patterns in demand to inform pricing, yield controls, product offerings, and duration. Demand data incudes data on customer and competitor behavior, together with demand trends and patterns. Analytical revenue management relies on in-depth records of historical trends. Recording transaction

details, operating performance, and customer characteristics for individual transactions enriches demand analysis. Analytical revenue management relies on accurate records of historical trends. Regular collection of transactional, competitive, and environmental demand data improves accuracy in demand analysis.

Considerations for Adopting Revenue Management Practices

The revenue management framework presented in this MONOGRAPH (Table 3) provides businesses with functional objectives that can contribute to achieving higher intensity of revenue management practice. These priorities may conflict with traditional management accounting functions that focus on cost control and external financial reporting. Yet priorities involving revenue management can motivate synergies between revenue and cost systems. Some practices are relatively cost-neutral and so are determined based on competitive pressures and strategic choices. Other practices require additional resource investment for improved practice and so are more closely related to cost-benefit notions.

Pricing by customer needs may not be more expensive than cost-based pricing in light of the challenge to separate and develop effective managerial costing systems that rise above external financial reporting purposes.[26] Product configuration encourages searching for cost-effective ways of enacting product differentiation, suggesting that higher intensity of practice (based more on contractual differences) is cheaper to implement than lower intensity of practice (based more on physical differences).

Higher intensity of duration control demands higher levels of management attention compared to lower intensity of this revenue management lever. This commitment requires modifying business processes and adjusting customer conditions to affect behavior. Barriers to implementation are organizational strategy, competitive environment, and customer resistance to change. These barriers dictate the ability businesses have to make these changes. For duration control practices, barriers may be difficult to penetrate when the organization has little market power or no strongly defined strategic niche.

Comparatively higher resource requirements are likely to arise when increasing the intensity of inventory allocation practices, which require regular managerial attention and computational analytical approaches. These demands on organization structure introduce the need for additional resources and costs during implementation as well as day-to-day investment. Inventory allocation procedures require frequent review and alterations to prices and product availability, with the highest intensity of practice requiring the review of many products in detail.

In addition, higher investment is required for more sophisticated data analytics required to support more complex revenue management practices. These investments may include advanced software packages or more highly trained staff who are skilled in applying analytical frameworks. The collection of external data may be required together with internal records, which typically increases the size of investment in the revenue management system. Improving the method of data collection may also increase the investment required and the

[26] IMA Managerial Costing Task Force, April 2019; IMA Managerial Costing Task Force, *Costing System Attributes That Support Good Decision Making*, IMA, October 2019, www.imanet.org/insights-and-trends/strategic-cost-management/costing-system-attributes-that-support-good-decision-making.

cost of collection. Implementation and day-to-day operational demands can create barriers to implementing new revenue management practices. Hence, organizations are likely to improve practice only if the additional benefit exceeds the required investment.

Many organizations are continuously improving and extending technology investments for other business needs. If the design of these investments can incorporate improvements in revenue management practices, then the incremental investment in technology for revenue management data gathering and analysis is more likely justified by benefits resulting from intensified revenue management practices.

Conclusion

Revenue management is not just an interesting area for management accounting. It is an essential area that complements accountants' resource management expertise, providing the knowledge skills necessary for the effective future-proofing of the management accounting role. Management accounting has achieved considerable success in making resource management more transparent and purposive, but its involvement in price setting has led to criticisms in some organizations that price-setting procedures have caused price to be a hostage of the organization's cost structure.[27]

The revenue management role for the management accountant must encompass demand management as well as resource management. Indeed, revenue management extends conventional resource management to focus on the best use of resources to optimize customer profitability. With a dominant focus on customers and their willingness to pay, management accounting should tailor its resource management efforts to emphasize revenue management objectives. Relevance is regained, indeed, "where the customer is in charge."[28]

Main Takeaways

The main takeaways from this monograph are as follows:

- Understanding the customer and recognizing differences in needs and willingness to pay are the foundations of revenue management. The ability to segment customers enables service delivery and resources to be aligned and optimized by delivering the right product at the right price at the right time to the right customer. This requires demand and resource management to work hand in hand.
- Pricing basis and inventory allocation are the two main levers for demand management.
    - Pricing basis reflects willingness to pay and recognizes differences across segmented customer groups. For example, corporate customers may have a higher need for cutting-edge personal technology devices and are willing to pay more, as compared to retail customers whose technology needs and willingness to pay are lower.
    - Inventory allocation determines how resource capacity can be exploited and shared across customer segments, whether it be traditional inventories of product or units of available service capacity. For example, as client demand increases during busy season(s), the allocation of audit staff time at a CPA firm should be carefully prioritized and coordinated with pricing basis analysis of customer segments.
- Product configuration and duration control are the two main levers for resource management.

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[27] Reinaldo Guerreiro, Sergio Rodrigues Bio, and Elvira Vazquez Villamor Merschmann, "Cost-to-serve measurement and customer profitability analysis," *The International Journal of Logistics Management*, November 2008, pp. 389-407.

[28] H. Thomas Johnson, "Relevance Regained: Total Quality Management and the Role of Management Accounting," *Critical Perspectives on Accounting*, September 1994, pp. 259-267.

    - Product configuration tailors the service to customer segment needs using combinations of physical and nonphysical elements. For example, certain concert seats have closer proximity to the performer (physical), while types of concert tickets can have different conditions around refunds and advance payment (nonphysical).
    - Duration control focuses on time variability and how this can be managed for individual customers and time of day. For example, a golf course may require players to use a golf cart to shorten playing time during peak hours of play.
- Revenue management is not a one-size-fits-all model. The four levers of revenue management should be deployed to recognize and support the different environments in which organizations operate, as well as different organizational structures and objectives. Cost-benefit considerations should guide the appropriate level of revenue management intensity as set out in Table 1. In particular, the types of data, collection methods, and sophistication of analysis will vary across different organizations. While not every business needs the same intensity of revenue management sophistication, management accountants should be on the lookout for opportunities to adjust the intensity level if the payoff is positive. A self-assessment using the tools provided in this monomgraph may reveal such opportunities.
- The inclusion of revenue drivers with cost drivers provides a powerful tool for modeling and analysis built on causality and facilitating analogy, as introduced in the IMA CFMC. Causality provides the foundation between an underlying reality and the financial model, whereas analogy applies this knowledge to optimize management decisions. Knowledge of revenue and cost driver causal relationships can identify opportunities to improve revenues by reexamining customer segments and further adjusting the four levers. Management accountants who bring forward this knowledge to the design of performance measures and control systems can partner with executives to accelerate strategy.
- A key insight from contemplation of both revenue and cost drivers is that all revenue drivers are cost drivers, but not all cost drivers are revenue drivers. Many organizations have ignored the former at their peril—slashing costs to only discover that they also slashed revenue. Nevertheless, cost reduction can and should be accomplished by identifying and focusing efficiency efforts on resource use and work activities that do not drive revenue.

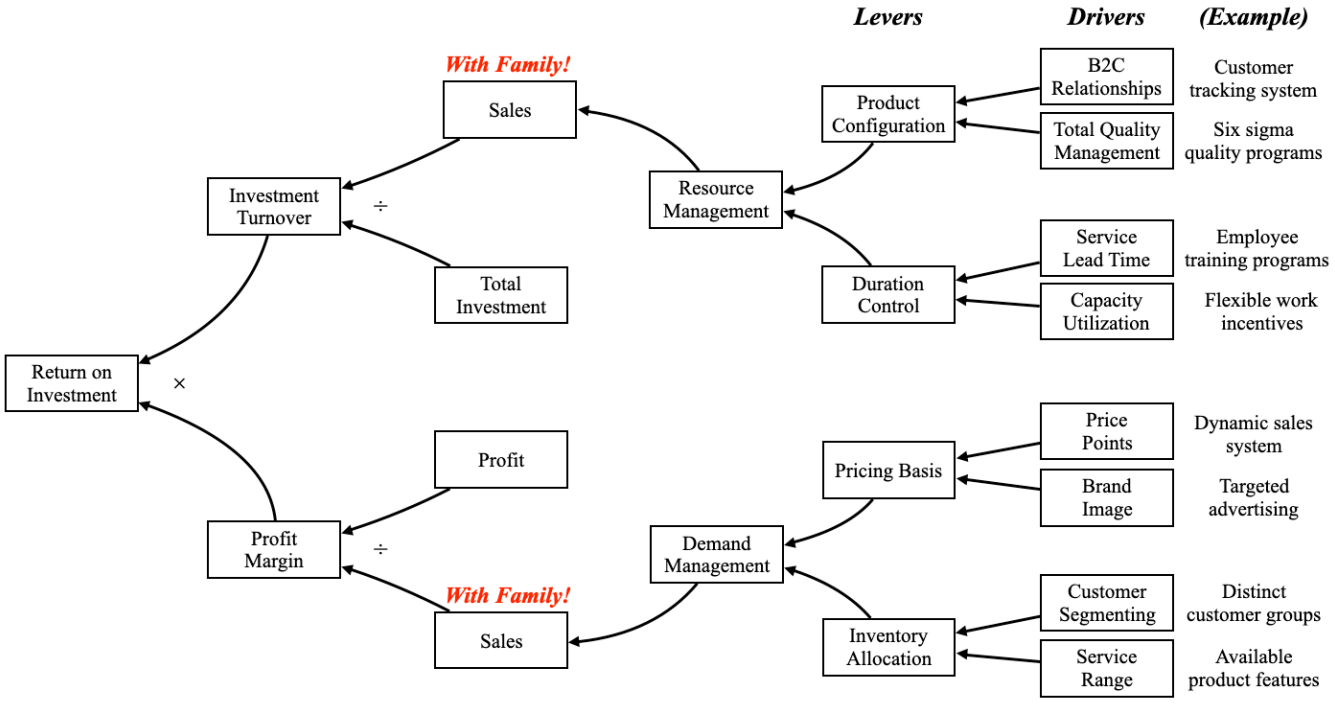
Expanding the ROI Model

We began this monograph noting that the DuPont ROI model "orphans" the sales elements of ROI (see Figure 1). Why? Perhaps early 20th Century thinking in management had a strong supply-side perspective with an emphasis on direct control of costs and investments. As displayed in Figure 1, the DuPont model expands logically. Its cost and investment elements can be mathematically decomposed into finer detail. The exactness of drilling down into these elements is compelling.

On the other hand, revenues are more difficult to plan, control, and evaluate. External environment factors have a greater impact on sales than they do on costs and investments. The sales element that runs throughout the DuPont model is not a function of a formulaic linear process. Compared to cost and investments, there is more uncertainty about the underlying control factors that drive sales, perhaps so much that management accountants hesitate to commit their resources to comparable systems and analytics in support of sales and revenue management.

Figure 4 illustrates how the DuPont model might be extended with sales, no longer orphaned, but now firmly established with its own family comprising both demand and resource management drivers. Note that resource management is associated with the investment turnover arm in the DuPont model, which decomposes into product configuration and duration control revenue levers. Demand management is aligned with the profit margin arm of the model and branches out into the pricing basis and inventory allocation levers. The example drivers in Table 8 are used to illustrate how an organization can further decompose the model into specific implementations of a revenue strategy.

Figure 4: The DuPont ROI Model (Expanded on Sales)



This expanded DuPont model demonstrates a pathway for finer-grained revenue analysis and performance capability investigation. When integrated with the original DuPont model that breaks down the elements using income statement and balance sheet items with a strong financial accounting focus, we believe that a century after its development it is time for this model to be revised and expanded to incorporate advances in revenue and resource management concepts.

Management accountants and educators of management accountants need a better vehicle to be involved in the revenue value creation process and move into stronger roles that contribute to strategy realization. Clearly accountants are not the harbingers of revenue management in the organization, but the accounting profession provides certain key qualities that are often missing in this critical work in organizations, including:

- Rigorous modeling
- Performance metricizing
- Data quality and control
- Systematized data analytics

For the last century, management accountants have been successfully employing management models and establishing causal drivers in partnership with executives to achieve strategic objectives involving costs and investments. This same work can and should be accomplished with sales and revenue. In partnership with marketing and sales functions, accountants can use this monograph to lay out a management model and causal driver approach that can be used to evaluate the sophistication of an organization's revenue management system and then redesign that system with optimal analytics and metrics that support the organization's strategic objectives.

Appendix: Case Study Examples of Revenue Management Practice Intensity

This appendix provides three brief case studies describing actual organizations (names have been changed). We include two restaurants and a retailer to provide examples of revenue management beyond the traditional examples in the airline and hotel industries.

The two restaurants are a stand-alone family restaurant and an international fast-food chain. They illustrate the different approaches that companies can take to revenue management based on the four levers of revenue management. The retail example is provided to show revenue management principles in a goods-based context. For each organization we provide a description of the company, classify their revenue management practice using the four levers of revenue management, and note examples of their practice for each lever.

BigFood is part of an international fast-food company. It has more than 70 restaurants around the country and employs more than 2,000. While a part of an international franchise, BigFood management is relatively free to make strategic and day-to-day management decisions within broadly prescribed limits. Revenue-focused decisions are primarily centralized, with the marketing and operations department responsible for pricing, promotional activity, and product availability that are consistent nationwide. Restaurant-level managers operate within a structured set of standard operating procedures, although they have some scope to use store-specific promotional offers. The organization had recently undergone a change in ownership, which led to a change in business philosophy to revenue-focused decisions, rather than the previous internal cost focus. This revenue focus incorporates competitor and customer behavior. At the head office level, pricing and product availability decisions emphasize data collection and quantifiable results. Support for these decisions include financial analysis (variances and trends, and scenario modeling) and qualitative data collection (competitor site visits and benchmarking products).

Table A1: Revenue Management at BigFood

Pricing Basis	Inventory Allocation	Product Configuration	Duration Control
Pricing is strategic, aimed at a price point relative to the market. Pricing captures differences among groups or area trends. (Level 3)	A fixed schedule determines how prices and priorities change over the year. These are across-the-board changes. (Level 2)	New products are regularly created using existing core inputs and processes. Product range is structured around restrictions and add-ons. (Level 4)	Initiatives regulate customer arrivals and discourage bespoke requests with a strong focus on changing customer behavior. (Level 4)
• Pricing is one of many levers of revenue management, complementing product mix and duration management. • Changing pricing across the network is a costly and formal process.	• Product mix and drive-through emphasis are the main methods of prioritizing higher-value customers. • Static menus and an inability to formally prioritize higher-value customers cause mismatches during different time periods and in different locations.	• Strong evidence that product range is linked with customer segmentation. • Product range is created from a common set of ingredients and resources. • Stores are required to follow head-office decisions about product range, but this intended product mix does not always fit at the store level.	• Head-office operations actively manage national systems used to regulate duration. • The network formulaically controls standard operating procedures. • Sample initiatives: Layout and equipment changes are being implemented to improve operations processes.

SmallFood is a stand-alone Malaysian restaurant owned by a husband and wife team that has been operating for two years. It seats a maximum of 36 guests and is located close to several academic institutions, apartments, and student hostels. The owners previously held managerial and head-office positions at several international fast-food chains. *SmallFood* is the fifth restaurant they have set up over approximately 30 years and is the only one they currently manage. They have established a "middle of the road" market position to target students and office staff, with an average price of about $11 per meal. The owner team jointly makes all internal decisions, with an external accounting firm hired for compliance work. Revenue-focused decisions are made exclusively using managerial experience. Sparse records are kept of day-to-day sales, limited to handwritten orders and a cash register that only records total amounts received. Managerial effort is focused on operations and developing new menu items rather than formulating revenue-focused strategies.

Table A2: Revenue Management at SmallFood

Pricing Basis	Inventory Allocation	Product Configuration	Duration Control
Pricing is primarily cost-plus or following not-for-profit objectives. (Level 1)	No change or infrequent changes in price and customer priorities, often informed by unstructured judgment. (Level 1)	Offerings vary in either inputs or processes. Radical new products are introduced as tactical responses. (Level 2)	Initiatives target overall improvement or to speed up internal processes as problems arise without focusing on reducing customer variation. (Level 1)
• Prices are mainly based on competitor benchmarking and ingredient costs. • Prices are purposefully held constant for the first three years of business to encourage repeat patronage.	• No examples of capacity reservation found. • Some customers are lost during periods of high demand.	• Menu items are chosen based on authenticity and for variety rather than customer segmentation. • New products are positioned at a higher price point to existing menu items.	• Operating procedures are unchanged between busy and slow periods. • Duration controls focus on entire processes; employees aim to do the same activities faster.

Retailer is a stand-alone entertainment store that sells a range of music formats, gaming formats, clothing, and books. It is positioned as a specialty retailer, aiming to provide an immersive shopping experience. Compared to its larger competitors, Retailer maintains an extensive product catalog, preferring to compete through differentiation rather than price. This objective is achieved through a strong secondhand market, supplemented with an in-depth range of new products. Retailer is run by two owner-operators who oversee 27 staff employees. Revenue-focused decisions aim to balance the cost of processing a diverse inventory base and the benefit of price movements in response to demand patterns. This relies on a try-and-see approach using small, frequent orders to gauge product popularity and the need for price changes. Decisions about pricing and product availability make strong use of item-level and product-level transaction histories. These data are collected using point-of-sale systems and inventory management software. Yet given the nature of the entertainment industry, there is also a strong reliance on manager experience to understand industry trends.

Table A3: Revenue Management at Retailer

Pricing Basis	Inventory Allocation	Product Configuration	Duration Control
Pricing follows market standard prices. Limited variation in prices among different groups or area trends. (Level 2)	Periodic review to inform price and priority changes. Changes target groups of products and broad time periods. (Level 3)	Offerings vary in either inputs or processes. Radical new products are introduced as tactical responses. (Level 2)	Initiatives target overall improvement or to speed up internal processes as problems arise without focusing on reducing customer variation. (Level 1)
• New products are first priced at cost-plus. The price is adjusted for popularity when the product is restocked. • Some evidence of differential pricing by customer segment; this is in the form of a club member program.	• A try-and-see approach is used to incrementally move prices of new product. This is based on speed of stock out. • A business model of small, frequent orders determines the appropriate yield control methods. • Yield control methods are chosen to balance the cost of processing stock and the benefit of price movements.	• The business model has evolved from a second-hand shop "discovery" experience toward a deep-catalog "comprehensive" experience. • Working capital cost of maintaining a deep catalog is controlled using small order sizes. This may require more staff costs than if larger orders were used. • Cost of certain promotions and products is prohibitively high due to the nature of the market and customers.	• Customer behavior is relatively stable in this retail environment. Accordingly, fewer duration controls are needed.