



The Association of
Accountants and
Financial Professionals
in Business



The Conceptual Framework for Managerial Costing

Statement on Management Accounting

13

About IMA®

IMA, the association of accountants and financial professionals in business, is one of the largest and most respected associations focused exclusively on advancing the management accounting profession. Globally, IMA supports the profession through research, the CMA® (Certified Management Accountant) program, continuing education, networking, and advocacy of the highest ethical business practices. IMA has a global network of more than 70,000 members in 120 countries and 300 professional and student chapters. Headquartered in Montvale, N.J., USA, IMA provides localized services through its four global regions: The Americas, Asia/Pacific, Europe, and Middle East/Africa. For more information about IMA, please visit www.imanet.org.



About the Authors

Larry R. White, CMA, CFM, CGFM, CPA

Larry White is Executive Director for the Resource Consumption Accounting Institute. He was Chair of the IMA Global Board of Directors for 2004-2005 and led IMA's Managerial Costing Conceptual Framework Task Force. He can be reached at lwhite@rcainstitute.org or rwhitecma@hotmail.com.

B. Douglas Clinton, CMA, CPA, Ph.D.

Doug Clinton is the Alta Via Consulting Professor of Management Accountancy at Northern Illinois University. He can be reached at clinton@niu.edu or (815) 753-6804.

IMA Research

Statements on Management Accounting

SMA's present IMA's position on best practices in management accounting. These authoritative monographs cover the broad range of issues encountered in practice.



Transforming the Finance Function

This research area focuses on how organizations align employee actions with their strategic goals. It includes operational control systems that focus on measures that enable front-line employees to achieve continuous process improvement. It also includes management control systems that enable managers to align their actions with the company's overall strategic goals.

The Conceptual Framework for Managerial Costing

Table of Contents

Introduction.....	5
Using the Framework.....	6
Overview of the Framework.....	6
The Objective of Managerial Costing.....	7
Role of the Management Accountant.....	8
Understanding the Conceptual Framework for Managerial Costing.....	9
Principles for Managerial Costing.....	9
Concepts for Managerial Costing.....	10
Concepts for Information Use.....	17
Overview of Information Use Concepts.....	17
Constraints for Managerial Costing.....	19
Constraints for Information Use.....	20
Applying the Conceptual Framework for Managerial Costing.....	20
Understanding the Connection to Strategy and Strategy Execution.....	20
Designing and Building Cost Models.....	23
Implementing Cost Models.....	25
Usable Cost Information.....	29
Evaluating Costing Approaches.....	31
Conclusion.....	32
Appendix.....	33



Introduction

This document presents a framework for managerial costing that enables organizations to determine what cost information best serves their internal decision support needs while having some assurance that their cost modeling approach is sound. The framework enables the evaluation of costing approaches and helps organizations determine which costing approaches will best match their cost modeling needs based on internationally accepted costing principles.

The framework focuses on cost modeling for decision support. The intention is to place managerial costing on a clearly established and well-reasoned conceptual foundation of principles, concepts, and constraints to support decision making. The Conceptual Framework of Managerial Costing is not a specific costing approach. Rather, the framework provides a beneficial, comprehensive, and logical baseline for comparing, selecting, implementing, or designing costing approaches.

The need to create a conceptual framework results from two problems. First, financial accounting and reporting for external users is guided by standards, regulations, and rules that impair the creation of optimal cost information for internal decision use. Second, although cost information is useful for a variety of purposes for both external and internal users, the most appropriate cost modeling approach for decision support inside organizations has not been universally agreed upon or the criteria for a modeling approach has not been articulated clearly.

The desired outcome of the Managerial Costing Conceptual Framework is to help organizations design and build principles-based cost models that managers can successfully apply to improve their operations and achieve their strategic goals.

KEY TERMS

Managerial accounting is a profession that involves partnering in management decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy. IMA, *Definition of Management Accounting*, Statement of Management Accounting, 2008.

Cost accounting is measuring and reporting costs intended for external financial reporting or regulatory purposes where guidelines and principles must be followed and complied with to meet regulatory, legal, or other defined standards and requirements. (IFAC (International Federation of Accountants), "Evaluating and Improving Costing in Organizations," *International Good Practice Guidance*, July 2009.)

Managerial costing is costing done purely for the organization to use internally to ensure that information for decisions reflects the characteristics of the organization's resources and operations.



Using the Framework

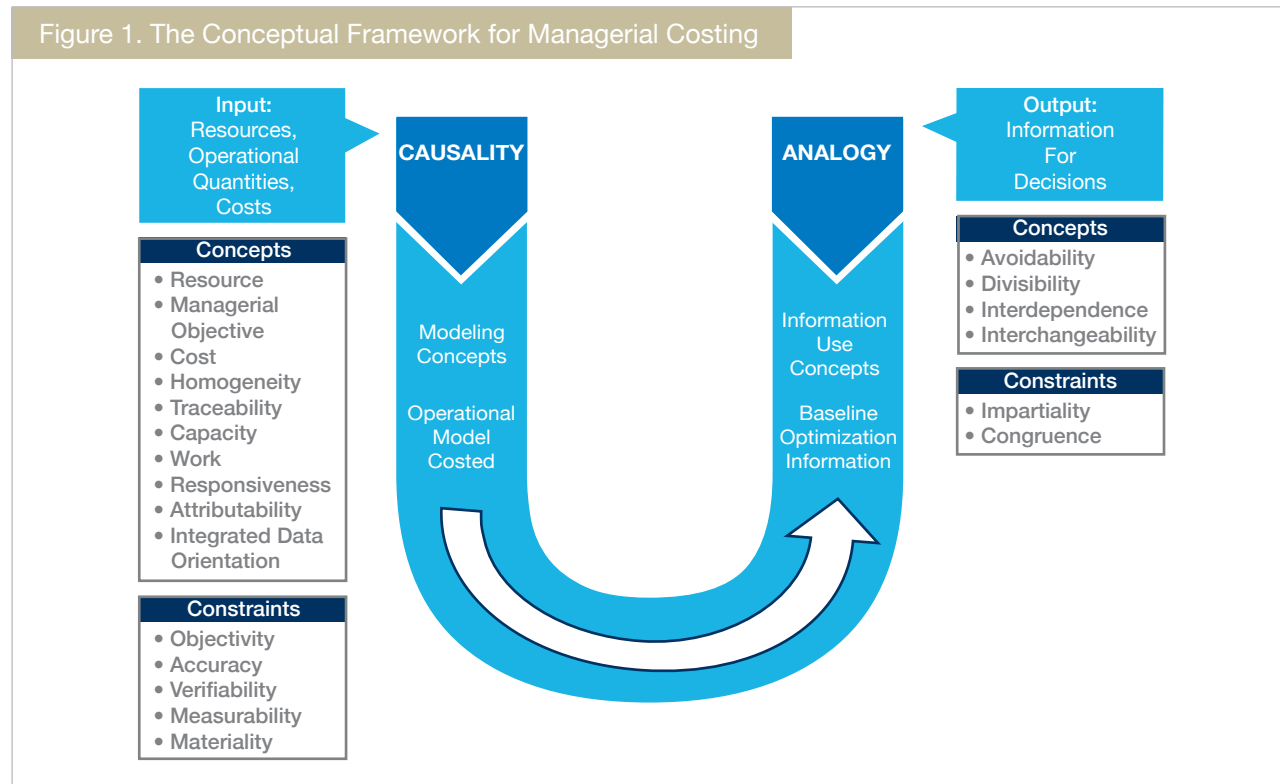
The Conceptual Framework for Managerial Costing serves multiple purposes for practitioners and academia:

- It provides guidance for designing cost models that accurately reflect operations and processes for the decisions that organizations need to make most frequently;
- It establishes a reliable reference for generating cost information for internal management use that clarifies why this cost information is different from external financial reporting, tax, and regulatory cost information; and
- It details guidelines for comparing the strengths and weaknesses of existing and alternate approaches to generating decision-relevant cost information.

Overview of the Framework

Cost modeling provides a monetary representation of the organization's resources, processes, and products and services. And the Conceptual Framework for Managerial Costing outlines the principles, concepts, and constraints necessary for effective cost modeling.

The guiding principle for operations modeling (and, hence, cost modeling) is causality, the ability to reflect cause-and-effect relationships. A useful cost model must efficiently guide a manager (1) from a monetary effect to the operational cause and (2) to clear and direct insight into the probable monetary effect of a particular operational action (or cause) being considered.



¹ This document takes a more practical approach to the conceptual framework for managerial costing. For a more detailed and academic discussion, refer to the full document: *Conceptual Framework for Managerial Costing*.



By applying the principle of causality and its associated concepts, we can create a model that represents an organization's operations and explains the resulting financial results. This establishes the baseline from which managers will seek to achieve strategy in an optimal manner.

The guiding principle for decision making is analogy—the use of causal insights to infer past or future causes or effects. Managers use cost information by applying the principle of analogy to infer past or future causes or effects. This results in learning from the past, making plans for the future, and supporting resource application decisions to achieve strategic objectives.

The Objective of Managerial Costing

The objective of managerial costing is to:

1. Provide a monetary reflection of the utilization of business resources and
2. Relate cause-and-effect insights into past, present, or future enterprise economic activities.

Managerial costing aids managers in their analysis and decision making and supports optimizing the achievement of an enterprise's strategic objectives.

Internal operations are the focus of managerial costing, and managerial costing's primary customer is internal management. At its essence, managerial costing describes the links among an organization's resources, activities, products, and services to produce an understanding of economic relationships expressed, ultimately, in monetary terms. The result is a managerial costing model.

KEY TERMS

Monetary Reflection: Managerial costing must support detailed economic decision making and must accurately reflect the actual resources and processes in monetary terms.

Resources: To achieve strategic objectives, organizations acquire and deploy resources such as people, machinery, buildings, and capital. The acquisition and deployment of resources also comprises the source of all of an organization's costs.

Cause-and-Effect Insights: Internal management makes rational inferences about resource application when making decisions concerning process design, improving operational efficiency and effectiveness, and strategy execution.

Enterprise Economic Activity: Enterprise economic activity refers to operations beyond just production or service operations. It includes all the resources used to achieve strategic objectives.

Managers: Managerial costing focuses on the needs of managers and employees making decisions inside an organization.

Analysis and Decision Making: Analysis focuses on facilitating learning and gaining knowledge about the enterprise's economic activity, specifically its resources and their capabilities, with a view toward achieving strategic objectives.

Optimizing: Internal management is tasked with achieving enterprise strategic objectives by employing resources to realize maximum benefit at minimum cost.

Enterprise Strategic Objectives: Objectives can be financial or nonfinancial.



Role of the Management Accountant

One role of the management accountant is to provide information to support the decisions of managers and employees who seek to optimize business operations. Managerial costing information may be useful externally, but it needs to be evaluated against external reporting principles, standards, and laws that govern such uses. The following eight tenets capture the scope of managerial costing for internal use:

1. Provide internal managers and employees with an accurate, objective cost model of the organization and cost information that reflects the use of the organization's resources.
2. Present decision-support information in a flexible manner that caters to the timeline for insights needed by internal decision makers.
3. Provide internal decision makers with insight into the marginal/incremental aspects of the alternatives they are considering.
4. Model quantitative cause-and-effect linkages between outputs and the inputs required to produce and deliver those outputs.
5. Accurately value the supply and consumption of resources to the operations and support processes of an organization in monetary terms.
6. Provide information that aids in both immediate and forward-looking internal decision making for optimization, growth, and attainment of enterprise strategic objectives.
7. Provide internal information to evaluate performance and learn from results.
8. Provide the basis and baseline factors for exploratory and predictive managerial activities.



Understanding the Conceptual Framework for Managerial Costing

Principles for Managerial Costing

The design, implementation, and use of a managerial costing model must apply two principles—causality and analogy. Causality deals with capturing and understanding enterprise quantitative cause and effect relationships. Analogy is concerned with applying causal information in optimization actions.

KEY TERMS

Causality: The relation between a managerial objective's quantitative output and the input quantities consumed if the output is to be achieved.²

Analogy: The use of causal insights to infer past or future causes or effects.

To support managers' pursuit of optimal resource usage, managerial costing is concerned with modeling a sound quantitative representation of all of an organization's resources, goods, and services. Quantitative information about the consumption of resources and the outputs produced forms the basis for determining managerial costing monetary information and supports the ability to effectively manage an enterprise. The more accurate the models are and the more valid the assumptions, the closer they reflect the reality of the organization's resources and processes.

The backbone of managerial costing is an operational model composed of outputs and their required input (resource) quantities. Instead of a primary focus on parsing the general ledger's monetary units (e.g., dollars, euros) into financial metrics, a quantity-based causal cost 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 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 in processes, and
2. Monetarily, it provides the financial valuation of the resource quantity relationships.

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 cost 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 of an organization. (See the Appendix for a discussion on the Strength of Causality.)

² Adapted from Gordon Shillinglaw, "Cost Accounting Principles for External Reporting: A Conceptual Framework," *Essays in Honor of William A. Paton*, University of Michigan, Ann Arbor, Mich., 1979, p. 162.



Concepts for Managerial Costing

The concepts for managerial costing are framed by two fundamental and connected views:

1. The measurement and capture of an organization's resources and costs (referred to as "modeling") and
2. The use of that information for decision making.

The objective of the cost modeling view is to provide measurements and calculations (including rates) that reflect the consumption of the organization's resources in support, administrative, and product- or service-producing operations. A highly effective model provides the baseline information for a large variety of internal management activities, such as planning and improving operations as well as evaluating performance.

Causality is the principle that governs constructing managerial costing's operational model and the information the model provides.

The intent of the information use view is to provide a basis for how decision makers at any level (including managers, supervisors, or employees) should apply the results of the cost model to gain insights and draw inferences to make decisions and take action. Decision makers apply insights gained from the model's information to infer the use of existing resources for new purposes or new resources for existing purposes (i.e., in an analogous manner). **Analogy** is the principle used in applying the model information to select an optimal decision alternative and take adaptive and corrective actions.

Overview of Modeling Concepts

These concepts serve as the building blocks for a reflective cause-and-effect-based model of an organization's operations:

1. The **constructs** that make up an enterprise's operational model (resources and managerial objectives);
2. **Characteristics** of those constructs (cost, homogeneity, traceability, capacity, and work);
3. The **relationships** between the constructs in the model (responsiveness and attributability); and
4. The nature of the **data** needed for the model (integrated data orientation).



Among the first things to consider when designing a cause-and-effect-based model to be reflective of an organization's operations are:

- What are we trying to accomplish? (**managerial objectives**)
- What do we have at our disposal to accomplish these objectives? (**resources**)

Resources: *The people, machines, information technology, raw materials, and items/intellectual property developed internally (e.g., a hospital's billing software developed in-house).* Based on an intentionally broad definition, resources can be:

- The source of all costs.
- The entities that have productive capacity.
- The quantitative entities that decision makers must adjust or influence to effect change.
- The basic building blocks in optimization; they determine the magnitude of incremental gain in any optimization activity.

Managerial objectives: *Specific results or outcomes of the application or provision of resources that management chooses to monitor for the purpose of enabling one or more managerial activities.* Key considerations of managerial objectives include:

1. Achieving managerial objectives is the reason for employing resources to produce output.
2. Establishing and managing discrete managerial objectives is necessary to achieve an enterprise's strategic objectives.
3. Managerial objectives align with managers' responsibilities, the need for measurement, accountability, and, ultimately, incentives.

Managerial objectives can be an organization's final outputs or any intermediate outputs. They can serve any measurement, analytical, or predictive purpose for whatever time frame managers deem appropriate. Examples of managerial objectives include production activities and support activities consumed internally, activities of external or contracted services, saleable products and services, target markets and market segments, and projects to build or acquire resources and infrastructure.

Managerial objectives consume resources, and most contribute to another downstream or higher-level managerial objective. An accurate reflection of consumption relationships between managerial objectives ensures all resources consumed in achieving a managerial objective can be identified. This allows the model to accumulate all of an objective's attributable costs—the closest one can get to full cost while remaining in compliance with the principle of causality. The resulting information provides cause-and-effect insights for analysis and decision support and serves as the baseline for determining relevant costs in decision making.



To create an effective cause-and-effect model requires capturing characteristics of the constructs used in the model. These include the characteristics of **cost, homogeneity, traceability, capacity, and work**.

Cost: *A monetary measure of (1) consuming a resource or its output to achieve a specific managerial objective, or (2) making a resource or its output available and not using it.* Determining the cost of resource use and managerial objectives is the purpose of managerial costing. Cost information presents resource consumption in monetary terms and allows for comparison between diverse alternatives.

The definition of cost emphasizes that the flow of money in a managerial costing model merely reflects the underlying operational consumption of goods and services. Money is the meta-language of economic activity and not the activity itself.

The cost associated with a managerial objective results from the relation between its output (production man hours, production machine hours, product quantities, etc.) and the inputs (labor, equipment, raw material, floor space, utilities, etc.) required to produce the output. Thus, the cost of an input is assigned to a managerial objective because that input quantity is required to achieve that objective—money reflects causal resource consumption. In this view, money is not allocated or assigned in the absence of a causal quantitative consumption relationship.

The definition of cost includes the costs of wasted or inactive resources (for example, a resource available for the achievement of managerial objectives but not used). From an optimization perspective, excess/idle capacity always has a cost impact—at the very least, an opportunity cost

Homogeneity: *A characteristic of one or more resources or inputs of similar technology or skill that allow for their costs to be governed by the same set of determinants and in an identical manner.* Homogeneity plays a key role in cost measurement and modeling. It allows for the grouping of resources with similar capabilities and capacities into a single managerial objective in order to manage, optimize, and charge for the use of those resources in a cost-effective manner. Organizational elements often need to be subdivided to achieve homogeneous groupings of resources.



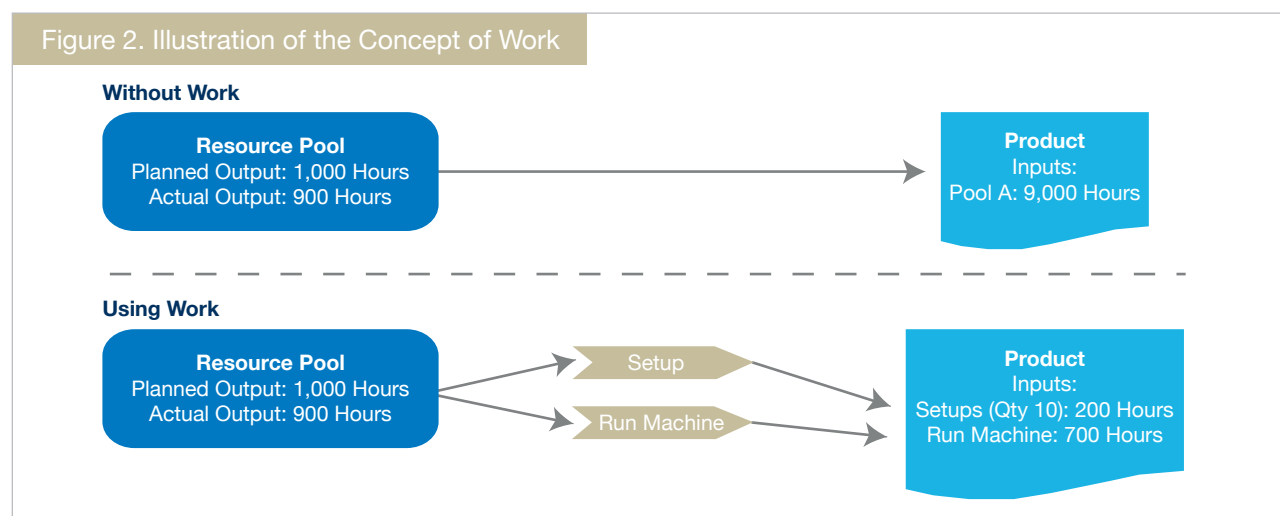
Traceability: *A characteristic of an input unit that permits it to be identified in its entirety with a specific managerial objective on the basis of verifiable transaction records.* Resource consumption must be connected with specific managerial objectives when a causal relationship exists. Traceability aligns with the quantitative nature of causality (i.e., a certain input quantity of resources is needed to produce a certain level of output). Examples of verifiable transaction records that allow for the tracing of resource quantities are bills of materials, product routing steps, material requisitions, time cards, invoices, transaction execution records in software applications, and machine design specifications and ratings.

The existence of traceability indicates the presence of a strong causal relationship. The lack of a quantitative consumption relationship must be modeled using attributability.

Capacity: *The potential for a resource to do work.* Capacity describes the limits of a resource's capability to contribute to achieving managerial objectives. Effectively using resource capacity to achieve a managerial objective is the key to optimization. Knowledge of excess or idle capacity also represents a major optimization opportunity. (See Appendix for a discussion of Modeling Capacity.)

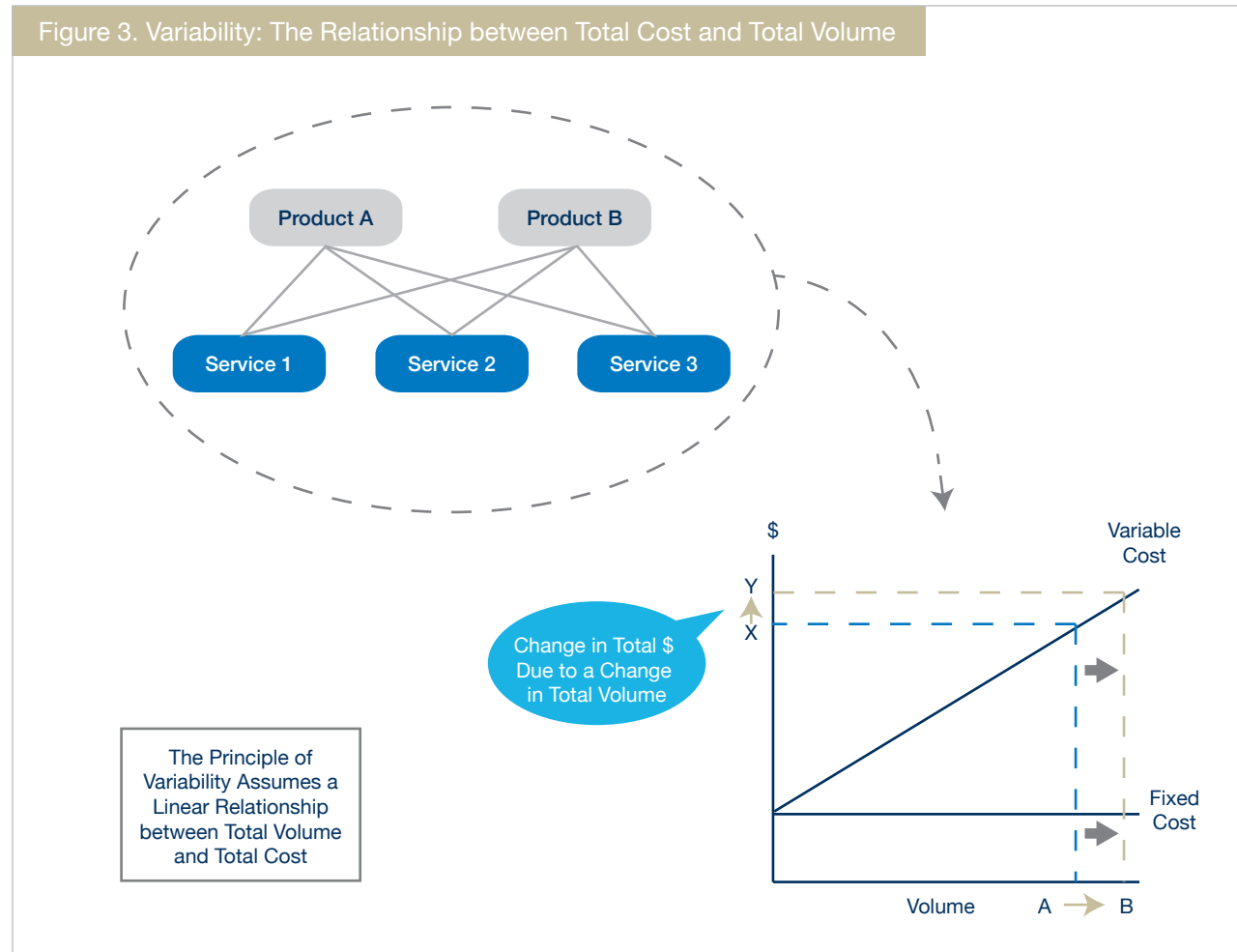
Work: *A measure of the specific nature of units of resource output.* Resources engage in specific work activities or business processes to accomplish managerial objectives. The ability to model work provides decision makers with an extra layer of detail when insight into the nature of work is beneficial to managers' optimization endeavors (e.g., for process improvement).

When used in modeling, work is beneficial in expressing a causal relationship and provides important decision-support information. Work activities do not have capacity themselves; they merely consume and transmit capacity use. An illustration of the consumption of resource quantities with and without the concept of work is provided in Figure 2. The effective modeling of work requires the use of resource quantities to maintain traceability of the resource capacities throughout an enterprise model.





Responsiveness: *The correlation between a particular managerial objective's output quantity and the input quantities required to produce that output.* Responsiveness replaces the conventional concept of variability. As illustrated in Figure 3, variability assumes that a change in total output from point A to point B will always result in a change in total cost from point X to point Y.

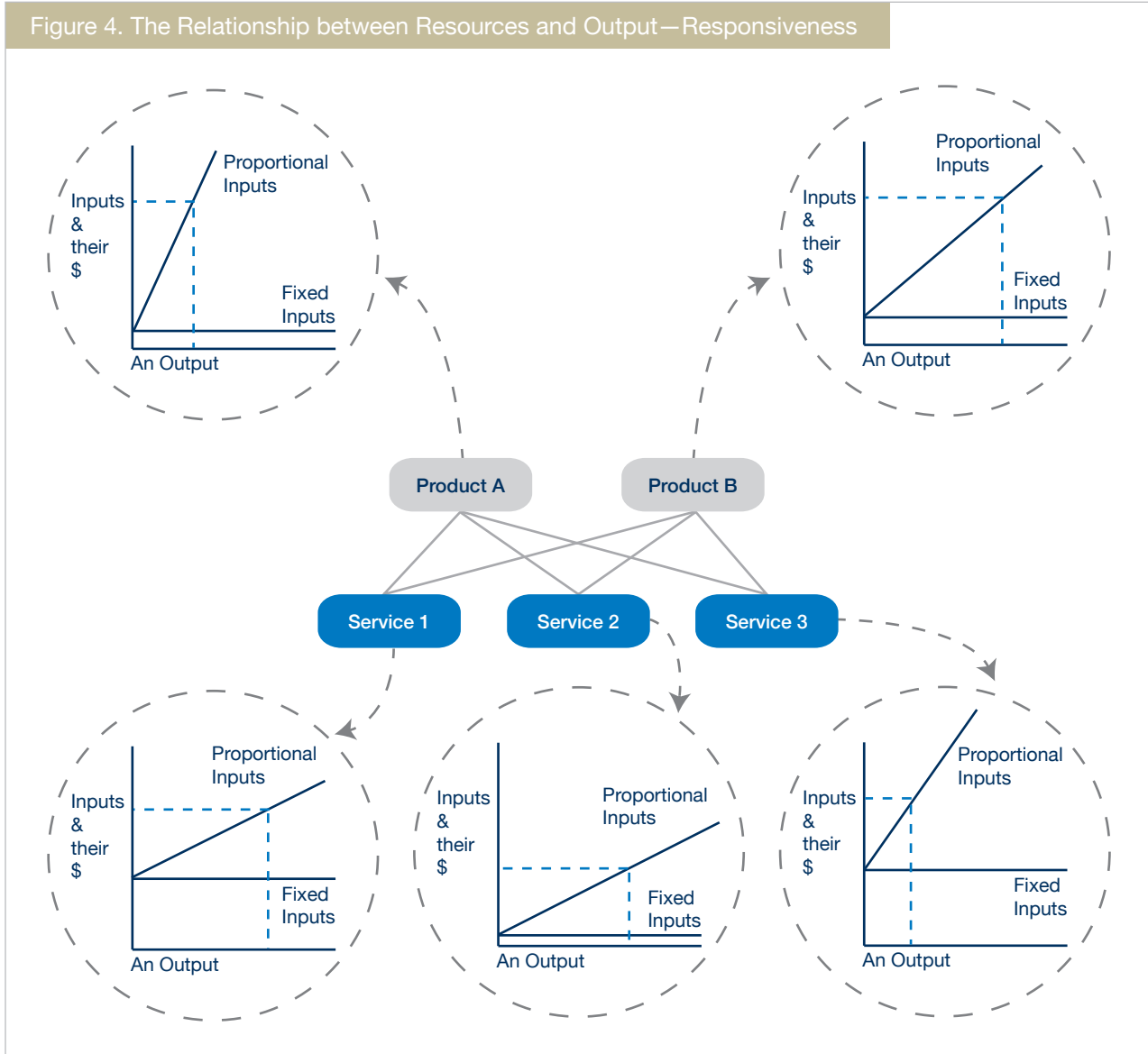


Responsiveness better captures the nature of cause-and-effect relationships. It enables the provision of accurate marginal cost information. Because causality is concerned with the relationship between an output and the inputs required to produce it, causality demands more specificity in cause-and-effect expressions than variability's aggregate-level assumption is able to provide. Responsiveness reflects the nature of quantitative consumption at individual (intermediate and final) managerial objective levels.

To provide managers with cause-and-effect insights and enable related inferences, responsiveness focuses on reflecting the nature of cause-and-effect relationships at the points within a process where managers must influence the behavior and consumption of resources, as shown in Figure 4.



Figure 4. The Relationship between Resources and Output—Responsiveness



Causal relationships can be static, dynamic, or a combination of both in relation to output. These characteristics are defined as follows:

- A **fixed responsiveness relationship** indicates that an input will be consumed regardless of changes in the level of output of the consuming managerial objective.
- A **proportional responsiveness relationship** indicates that demand for an input will change as the consuming objectives' output level changes.

The focus on resource quantities and the nature of causal relationships allows responsiveness to provide more nuanced information on relationships between total volume and total cost. Responsiveness is consistent with the quantitative definition of causality (i.e., money merely inherits the behavioral characteristic of its associated input quantity).



The concept of responsiveness is critical in striving for a reliable representation of operational cause-and-effect insights. Responsiveness—and the manner in which it accommodates causal relationships and their characteristics—provides managers with a superior operational foundation to base inferences in their analogous or information use activities such as analysis, decision making, and planning. Responsiveness is the cornerstone of the marginal/incremental information that a managerial costing model will provide.

Attributability: *The responsiveness of inputs to decisions that change the provision and/or consumption of resources.* Costs that can't be quantitatively associated with specific outputs in a relatively strong causal manner are governed by the concept of attributability. The common practice of allocating these costs to outputs arbitrarily or with a highly generalized driver distorts decision-making information at many levels of an organization.

Excess/idle capacity cost for a product group is an example of an attributable cost. If these costs are assigned to the products produced, production managers who become more efficient (doing the same amount of work with less resources) will only see distorted product costs arbitrarily inflated by allocation of the excess/idle costs. The excess/idle capacity costs instead should be attributed to the product group the particular machine is dedicated to. Utilizing excess/idle capacity achieved by efficiency improvements should be the responsibility of sales, marketing, or general management.

It is important to note that quantitative causal relationships in the managerial costing framework relate to specific outputs, while costs assigned based on the concept of attributability are generally assigned to business or organizational levels based on control and responsibility factors.

Integrated Data Orientation: *Information about an organization's economic resources, events, and their corresponding monetary values, free from traditional accounting conventions, which allows for the aggregation of elementary data elements and their values for any purpose.* Managerial costing requires a set of integrated operational and financial data sources that are consistently stored for access and retrieval throughout the organization rather than by financial users only. The concept of integrated data orientation moves managerial costing from being dependent on the general ledger, allowing a clean separation of financial accounting and managerial costing. Integrated data orientation views the general ledger as a valuation layer for financial accounting and reporting. Managerial costing requires its own valuation layer; one much more closely connected to nonfinancial data from resources and processes.

Enterprise resource planning (ERP) software data warehouse systems are well suited to implementing the integrative data concept within a cost model. ERP systems provide integration through the implementation of an enterprise database that spans the range of enterprise activities and overcomes traditional information technology silos. This may include reconciling and tracking differences between different valuation layers.



Concepts for Information Use

Overview of Information Use Concepts

The cost model generates information about the consumption of resources and their costs; however, decision makers must be knowledgeable about the appropriate concepts when using the information. Resources and managerial objectives are highly interdependent in a model, and countless qualitative factors can change and have an impact on their costs. The concepts governing information use fall into two groups:

1. Those primarily relevant to analysis (avoidability and divisibility).
2. Those primarily relevant to decision making (interdependence and interchangeability).

Avoidability: *A characteristic of an input that allows for the input (and hence its costs) to be eliminated as a result of a decision.* Avoidable cost is a cost incurred for a managerial objective that will—immediately or in a reasonable period of time—no longer be incurred if the need for that objective is eliminated.

Decision makers need to evaluate whether changes in resource consumption will result in the ability to avoid the costs of affected resources. Avoidability is a pivotal concept in analysis because for every decision scenario an enterprise faces, understanding the avoidable and unavoidable costs is crucial.

Divisibility: *A characteristic of a resource that allows it to be associated in its entirety with the change in a managerial objective's output resulting from a decision.* Resources are not always flexible. The magnitude of a cost-reduction decision depends on whether the resources affected by a decision can be eliminated or sold (i.e., if the resource is divisible, its cost can be avoided). Conversely, for a decision to increase capacity or output the resources' divisibility will determine the investment required.

Divisibility is a characteristic of resources that is critical to decision making since it is a key factor in determining whether costs are avoidable.

Interdependence: *A relation between managerial objectives that occurs because of a decision to use resources to achieve one objective that affects the amount or quality of resources required to achieve other objectives.* The concept of interdependence highlights the criticality of understanding the qualitative dimensions of an organization holistically. For example, opening a new plant, Plant B, may require the transfer of talented people from existing Plant A to help train the new workforce and establish operations quicker. This will have a direct impact on the productivity and costs of Plant A that will be apparent to managers but may be difficult to quantify.



No quantitative model, whether cost-oriented or purely operational, can fully substitute for a functional understanding of an organization. Without this understanding, there is still a great risk that even high-quality data and carefully constructed information will lead to less than optimal decisions. Interdependency is a qualitative causal factor that may outweigh quantitative consumption relationships and dictate a decision that may otherwise be considered suboptimal.

Interchangeability: *An attribute of any two or more resources or resource outputs that can be substituted for each other without affecting the costs of the other resources that are required to carry out the activities to which the interchangeable resources are devoted.* Managers need to consider all options for achieving managerial objectives in a timely manner. A resource with the capability to be used in several productive processes is often not modeled comprehensively, but it could be a viable alternative in many decision scenarios. Managers need to consider all options for such fungible resources for achieving managerial objectives.

The effects of interchangeability can often only be gleaned after the fact from the cause-and-effect insights incorporated in the cost model. For example, two workers do the same type of work, but one is less skilled and requires more inspection and rework. On the surface, these workers are interchangeable but, in reality, interchanging will change the cost structure of the resource pool. The cost impact of interchangeability is normally apparent in a historical analysis, but it is difficult to model since it is often unknown whether the substitution will be feasible or acceptable.



Constraints for Managerial Costing

Constraints are a boundary of the zone in which principles and concepts govern. They implicitly qualify the application of modeling and information use concepts.

Five constraints applied to the concepts associated with managerial cost modeling are **objectivity**, **accuracy**, **verifiability**, **measurability**, and **materiality**.

Objectivity: *A characteristic of a cost model that shows it to be free of any biases.* Managerial costing information can only be objective if the model that produces that information is constructed in an unbiased manner.

Accuracy: *The degree to which managerial costing information reflects the concepts you intended to model.* Accuracy is a characteristic of cost information and reflects the fidelity with which causal relationships between resources and managerial objectives are reflected in the cost model. Accuracy is conditional to the context for which cost information is to be used. That is, an organization with razor-thin margins requires more accuracy in modeling the relationships generating its cost information than a company with 80% or 90% margins.

Verifiability: *A characteristic of modeling information that leads independent reviewers to arrive at similar conclusions.* An objective of a modeler is to create a model that could be reviewed by an independent person who would arrive at similar conclusions about the model's design.

Measurability: *A characteristic of a causal relationship enabling it to be quantified with a reasonable amount of effort.* The measurability constraint requires a cost modeler to create a model with relationships that are quantifiable with a reasonable amount of effort.

Materiality: *A characteristic of cost modeling that would allow for simplification without compromising managers' decision-making needs.* The materiality constraint requires that the incremental benefits of greater insight must exceed the incremental administrative effort to provide the new information.



Constraints for Information Use

Two constraints applied to information use concepts are **impartiality** and **congruence**.

Impartiality: *The unbiased consideration of all resource application alternatives.*

Impartiality is an important component of any optimization activity in that it recognizes the need for a lack of prejudice on the part of managers and the consideration of all options for applying resources.

Congruence: *The interdependence of individual managerial actions to attempt to achieve both individual and enterprise objectives in an optimal manner.*

Congruence requires that managers recognize the dependence of overall enterprise optimization on their individual actions. All other things being equal, the alternative with the largest incremental overall gain over the status quo, despite potential localized suboptimal outcomes, is the optimal solution and the one that satisfies the congruence constraint.

Applying the Conceptual Framework for Managerial Costing

Understanding the Connection to Strategy and Strategy Execution

Managerial costing supports the achievement of an organization's strategic objectives and the optimization of its operations. The managerial costing practitioner must evaluate, understand, and incorporate the organization's strategy and operations into the design and implementation of an effective managerial cost model and then apply the resulting decision-support information effectively.

Where to Start

Current operations serve as the foundation for optimization activities. An organization's current investments (resources deployed), value chain, products/services, market segments, and customers equate to the status quo, and collectively they are what managers use to achieve strategic objectives.

Whenever change is considered, managers use current operations as the baseline in their decision making. In evaluating decision alternatives, managers' best guidance for future outcomes is often provided by understanding the cause-and-effect relationships in the conversion process they are attempting to influence and improve.

Enterprise Optimization: Context, Aim, And Scope

The design of a managerial cost model begins with understanding the organization's strategic managerial objectives. It's important to consider the context, aim, and scope associated with the organization and its strategy. Management accountants will need to make appropriate choices and trade-offs among the framework's concepts and constraints to find the correct balance and focus for their particular organization.



The model design must enable optimization decisions by incorporating the industry environment, competitive situation, and the company's own current conditions and disposition. These aspects comprise the company's optimization **context**, which determines the nature and frequency of the types of decisions its managers will make.

For example, selecting a new facility location could be strategic to one company (e.g., Toyota opening a new truck plant in Texas) and tactical to another (e.g., Starbucks opening a store on a corner one block away from another). Similarly, one more unit of output will be an operational decision for one company (e.g., an additional batch of dough for the local bakery) but a strategic decision to another (e.g., Boeing considering whether to make a B737 or divert the resources to B787 Dreamliner production to regain its competitive momentum against a competitor such as Airbus).

The optimization context provides managerial costing with a frame of reference and guides design and implementation of the cost model for effectively supporting managers. For example, in a distribution business, operational insights are critical to maximizing profitability (e.g., receiving, picking, packing, and shipping and understanding what a profitable minimum order size is). On the other hand, in an outsourcing business, the portfolio (the mix of products and services, e.g., application hosting, infrastructure, and business processes) structured and priced for a particular deal is critical.

Aim refers to a managerial action's strategic intent—more specifically, to change strategy (an adaptive action) or to reinforce existing strategy (a corrective action). The aim of optimization decisions require managerial costing to support planning, simulation, measurement, and analysis through cause-and-effect insights. For example, the costing model will be used to support changes in the company's existing strategy/ plan. These adaptive actions depend on information that will assist managers in making extrapolations and projections as to future outcomes. Managers are best served by models that produce cause-and-effect information with appropriate structure and detail to facilitate their forward-looking activities.

The costing model will also be used to support corrective actions—steps taken to bring an organization back on track with its existing objectives. Corrective actions are triggered by insights into the deviation of actual results from the plan or target. The preliminary focus is on understanding actual results, and their causes and effects, to help managers understand what has transpired and to guide appropriate corrective actions.

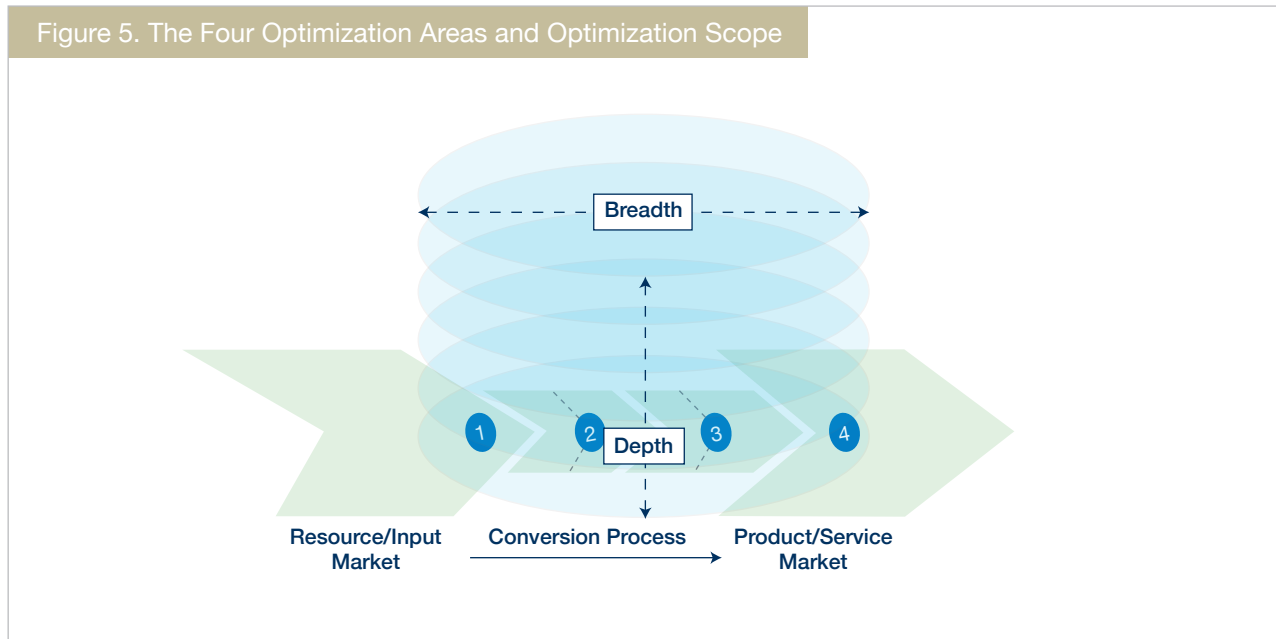


Scope addresses the breadth and depth of decisions to be supported by the model (see Figure 5).

For managerial costing, the breadth of optimization decisions dictates the types of managerial objectives to use and calculate values for in a model.³ Breadth consists of the four value chain optimization areas:

1. *Sourcing resource/input markets.* Decisions here consider new technologies, methods, and worker equipment resources, and strive to maximize limited capital resources through asset replacement, investment, sourcing, and outsourcing.
2. *Applying resource/inputs in conversion.* Efficiency is emphasized—doing things right—and decisions address resource application, utilization, realignment or redeployment, process improvements, eliminating waste, and capacity management.
3. *Producing outputs.* Effectiveness is the focus (doing the right things, producing the right outputs). This may include decisions that deal with product make-or-buy, supporting new product introduction, process improvements, reengineering, and eliminating waste.
4. *Realizing gain from enterprise outputs.* This involves creating the desired outcomes in product/service markets. Decisions cover target markets and market segments, costs-to-serve these, product/service mix, product discontinuance, entering new markets, creating new products/services for existing markets, and market mining.

Figure 5. The Four Optimization Areas and Optimization Scope



Source: Anton Van der Merwe, "Management Accounting Philosophy Series 3: Filling Up the Moat," *Cost Management*, November-December 2007.

³ In managerial costing, the types of managerial objectives can include those related to resources, work activities, products, service lines, distribution channels, and customers.



Depth is concerned with the information needs related to the magnitude of change that result from optimization decisions. Incisive decisions require deeper insight into causal relationships and the effects they are likely to have. To this end, decision-support information must comprise a range of cost constructs that provides insight into the level of optimization influence. The cost constructs include the following:

- Throughput costs (when deciding to produce one additional unit within the relevant range).⁴
- Incremental costs (the difference in total costs between two alternatives in a decision).
- Short-term proportional costs (when considering the opportunity cost of mutually exclusive uses of resources).
- Attributable costs (for divestment decisions such as a bank outsourcing its information technology function).
- Full costs (for strategic decisions, such as a tool manufacturer entering the South American market by establishing a plant in the region).⁵

Designing and Building Cost Models

Cost modeling entails six steps:

1. Identify the resources (and their costs) the organization retains for its use.
2. Identify the managerial objectives the resources support.
3. Develop an understanding of the cause-and-effect relationships between managerial objectives.
4. Design a model that captures the managerial objectives and their causal relationships.
5. Provide a description of the model to include its scope, intended uses, required inputs, outputs, and underlying assumptions and limitations.
6. Apply and maintain the cost model.

1. Identify the resources (and their costs) the organization retains for its use.

An understanding of each type of resource's inherent characteristics is needed, which starts with an understanding of the physical entities that managers oversee and about which they make decisions. Specifically, a modeler needs to understand each resource's output, storability, and cost behavior characteristics (i.e., whether the cost change is proportionate to output or remains fixed—the concept of responsiveness).

⁴ The *relevant range* is an economic term typically meaning a range where changes in demand levels require proportional changes in consumed material but not in the worker or equipment level.

⁵ Often referred to as fully absorbed or fully loaded costs.



2. Identify the managerial objectives the resources support.

A cost model reflects the reality of an organization's resources, the work and outputs of the resources, and how the work and output are consumed in producing intermediate and final outputs. One must understand all these to establish managerial objectives that are representative and will provide useful causal insights and related cost information.

Managerial objectives can be grouped into three tiers:

- Tier 1 is for resources and their outputs, which comprise resource pools and activities/processes.
- Tier 2 is for products and services, including production orders, service orders, and projects.
- Tier 3 is for result segments, including entity level (e.g., plant, business unit, or legal entity), market segment and target market cost objects. In "for profit" entities, these managerial objectives also include revenue to enable profitability management.

The particular managerial objectives a modeler employs are determined by managers' planning, analytical, decision-making, and optimization needs within strategic context, aim, and scope of the organization's strategy. They will correspond to individual managers' areas of responsibility.

3. Develop an understanding of the cause-and-effect relationships between managerial objectives.

Resources (captured in first-tier managerial objectives) are used to provide outputs that represent ultimate managerial objectives as well as outputs that become inputs used in achieving intermediate managerial objectives. In managerial costing, this system of inputs, intermediate outputs, and ultimate outputs must be understood and modeled. The model captures an organization's cause-and-effect relationships, which (in turn) serve as the basis for assigning resource costs through the model. It is also important to understand where causal relationships do not exist and apply the concept of attributability.

4. Design a model that captures the managerial objectives and their causal relationships.

Equipped with an understanding of the organization, its objectives, managers' needs, resources, their activities, and outputs, a management accountant can begin the tasks of designing an adequate representation of the relationships between resources and their consumers, expressed in quantitative input-output relationships. Once this quantitative model is established, resource costs serve to value the model in decision-appropriate monetary terms.



5. Provide a description of the model to include its scope, intended uses, required inputs, outputs, and underlying assumptions and limitations.

It is crucial that users of cost information understand not only the principles inherent in their cost model's conceptual design but also the underlying assumptions that were used in constructing the model and the model's limitations. For example, if financial depreciation is used, recognize the limitations of the model in providing insight into product life-cycle profitability and product/service gross margins due to the forced, and often much shorter, asset life used in financial depreciation compared to the actual economic life of the asset. That is, while the asset is being depreciated, products/services will be over-costed; once the asset is fully depreciated, products/services will be under-costed.

6. Apply and maintain the cost model.

By feeding resource costs and output quantities into a completed model, one can calculate costs for the various managerial objectives specified. These costs, then, are available for use in monitoring and decision-making activities. Keeping the model current, including adapting it to managers' changing analogous needs, is a vital part of consistently providing managers with relevant information. In model conceptual design, the constraints in the framework related to modeling (e.g., measurability and materiality) and to managers, analogous needs play an important role in curbing the size and complexity of the model. Many managerial costing initiatives have failed because modelers were unaware of what it would take to maintain their unrestrained conceptual design effort.

Implementing Cost Models

Implementing a managerial costing approach requires much more than understanding and applying the principles, concepts, and constraints articulated in this framework. The management accountant will need to lead or serve as part of a cross-functional team to address a wide variety of technical, managerial, and social/cultural issues that can impact an organization's effectiveness in using managerial costing to improve its information for decision making and its performance. Cost information is a critical component of an organization's performance information, and the decisions made with improved cost information will have an impact on everyone and every aspect of the organization.



Conceptual Design of the Managerial Costing Model and Solution

Managerial costing ultimately requires a software solution, but it can't be emphasized strongly enough that software selection is not the way to start implementing a managerial costing project. The first step is to understand the types of decisions the managers in your organization need to make in order to optimize their operations and achieve the organization's strategic objectives. This requires gaining a deep understanding of your organization's operations and helping managers and organizational leadership look beyond the financial information they currently use. What cost and operational information is needed to drive the organization's performance?

Managing the Introduction of a Costing Approach

Implementation of a managerial costing approach is complex and significantly touches most components of the organization. Applying project management techniques to a managerial costing project is critical. They help balance between cost, schedule, and performance. Without it, the project runs the risk of getting swamped by requirements growth, scope creep, or stonewalling.

Like most well-run projects, managerial costing initiatives should be segmented into smaller phased deliverables that can be assessed and approved by senior management on a regular basis. This keeps both the project staff and the rest of the organization focused on completing segments of the project. The early availability of improved information from more incisive managerial costing will lead to more sophisticated questions and demands for more in-depth modeling efforts. The project team and organizational leadership need to be prepared for this and focus on ensuring that the entire organization gets the benefit of the improved information before the project gets stuck in any one area.

Software

Again, it is extremely important that the initial step in a managerial costing project *should not* be the selection of software; neither should the software's capability dictate the conceptual design. An organization's managerial costing conceptual design must always precede an evaluation of software alternatives. This is true even if you already have an enterprise resource planning (ERP) suite in place.

Many managerial costing projects have suffered from being focused too much on software. This has inhibited the conceptual design phase of managerial costing because the tendency has been to focus on software implementation and making the organization's needs "fit" the selected software capability. First, evaluate the principles, concepts, and constraints outlined in this framework and consider how they may apply to your organization's strategy and for your optimization needs. Build a conceptual design, and then start to examine software alternatives to support your conceptual design, whether you own software or must acquire it.



There are three major types of software used to support managerial costing:

1. **Enterprise Resource Planning (ERP) Software:** Large-scale software with integrated modules. For managerial costing, an ERP system used in both logistics and finance may serve as an effective foundation for cost information. An ERP system used only for financial accounting and reporting may not have the resource and logistical information this framework considers indispensable for managerial costing. Operational systems such as manufacturing enterprise solutions may be a rich source of the necessary operational data.
2. **Best-of-Breed Managerial Costing Software:** A number of specialized software solutions exist for specific managerial costing approaches. Most integrate with ERP, financial, logistics, and operational systems. Over the years, many of the large ERP software vendors have purchased one or more of these solution providers, and they may be usable as independent modules.
3. **Business Intelligence Software:** This software focuses on integrating data across the enterprise and typically requires creating calculation engines to support managerial costing. This class of software works well for organizations that are small with simple needs or are large with unique needs and the expertise to develop solutions.

Data

This framework places a great deal of emphasis on operational data—information about an organization's processes and resources. Implementing a managerial costing approach based on this framework requires extensive familiarity with the operational and logistics data and supporting systems. A benefit is that employees in the operational and logistics areas will be more accepting when they know you have listened and learned about their work environments and challenges. The types of systems and data vary widely depending on the nature, size, and sophistication of the organization. This means the implementation team must discover what data, operational and financial, is being used as managers throughout the organization make decisions.

Source data quality is often an issue in managerial costing implementations. The real test is for the model to build its own credibility by providing information that accurately reflects operational resources and their monetary value and that allows for quicker, more accurate, and more profitable decisions throughout the organization.

Leadership and Change Management

A key to success effort is to recognize that a managerial costing implementation is not a technical accounting exercise. It is an undertaking to change the decision support and the performance information throughout the organization. It is common that a great amount of effort will involve overcoming resistance—making people feel comfortable and confident about the changing information and the practices to produce the information.



An effective way to look at resistance is to consider a relationship between three factors that affect resistance:

Strive to create a situation where

$$(D \times V \times F) > R$$

In this relationship:

- R is Resistance
- D is Dissatisfaction with the current state. Unless people have discomfort, they will rarely be interested in changing anything. People tend to prefer the status quo.
- V is a Vision of what “better” looks like. When people see a different view of their circumstances or a solution that can lead to an improved condition, they will consider changing.
- F stands for First practical steps, and it is often neglected. Some may think that having a lot of dissatisfaction (D) and a solid vision (V) is sufficient to overcome a large resistance (R). But large amounts of D and V are not enough. If people think the vision is overly theoretical, complicated, costly, or impractical, they will be reluctant to pursue changes to realize that vision. You need F to make the vision attainable.

Do not underestimate how large the R is; it can be enormous, even if it is relatively passive. If any of D, V, or F in the equation is zero or small, their combination will not exceed R. You will need appropriate considerations for all three factors.

People are not likely to want change if they are comfortable with the current situation. Can discomfort be introduced appropriately? An effective method might be applying a critical thinking method of questioning. For example, you could ask your executive team and colleagues questions like: Does our costing method result in more complex products with high technical support being subsidized by the simple products that use relatively little indirect and shared expenses? Are our largest customers our most profitable ones? Are any customers so demanding that the extra effort erodes our profits—but we don’t measure those costs? How do we know? How do we know which types of customers to retain, to grow, to acquire as new, or to win back? How much is optimal to spend on each customer type with deals, offers, and promotions to retain, grow, acquire, and win back those customers? Won’t any spending amount above or below the optimal for each customer type lead to destroying shareholder wealth?

In many cases, good answers can’t be provided, and if the response is “I don’t know,” the follow up should be, “Is that a good thing? How long can we keep making decisions without knowing these answers?” If these types of thought-provoking and deliberately disturbing questions are presented in the right way, there will be no need to spend much time on promoting the vision (V), the variable that many project champions typically prefer to emphasize. By converting and exposing latent problems into ones that are evident to your executives and colleagues, the need for change becomes more obvious.



An Organization's Acceptance of Managerial Costing

Using the framework to produce a well-designed, causal, and accurate managerial costing system generates informed users who understand and trust the information the cost system gives them. But be aware that those users must be nurtured and developed by the organization. Invariably, the success of a managerial costing initiative depends on how the organization responds to and uses the new cost information.

What is different for organizations with high-quality managerial costing in place? How is management different? What difference does it make for operations and nonfinancial personnel throughout the organization? Clearly, the availability of high-quality, trusted cost information will change organizational communications, particularly communications pertaining to economic decision making. The impacts of having highly usable cost information on analysis, decision making, communications, and managerial alignment throughout the organization are important factors in the ultimate success of a managerial costing initiative.

Organizations that achieve highly effective managerial costing are able to focus on business issues much quicker because they spend less time debating managerial costing practices, the quality of cost information, and efficacy of the underlying systems. They also have a wider range of employees empowered to use cost information to make decisions because the information will be widely understood and trusted.

To achieve this state requires the constant availability of cost information and the related operational and resource capacity information. This information must be in continuous use and under constant observation and evaluation.

Usable Cost Information

The effective application of the principle of causality and its supporting concepts will improve the usability of cost information within an organization. The key elements of usable cost information are the **transparency** of the information, its **defensibility**, and its **timeliness**.

Transparency means that users understand how the cost figures were calculated and whether the information reflects the cause-and-effect relationships within operations. A lack of transparency will cause most managers to ignore, to the extent possible, such cost information. The relevance and reliability of a costing system's information must be clear and demonstrable.

Managers will tend to second-guess opaque cost information. This distracts from critical analysis of other important decision factors. Debates about costing systems undercut efforts to improve decision-making processes within organizations. Transparent and causal cost information addresses the challenge of managers demanding evidence while quickly supplying accurate costs.



Defensibility means that the cost information can be used by both financial and nonfinancial personnel to build and evaluate business cases, explain results, support and explain decisions, and advocate ideas. Transparency will make cost information defensible to challenges about its accuracy for any given purpose. But this type of defense is most often mounted by the Finance department since it is the creator of cost information. Defensibility is truly achieved when managers and employees outside Finance can readily apply cost information when investigating operational problems or evaluating operational solutions without worrying that Finance will find fault with the cost figures used in the analysis. At that point, managerial costing becomes an enabling tool for a wide range of managers seeking to make better decisions about the employment of the resources under their control and investments that will improve the organization's performance. The key to making costing information defensible throughout the organization is applying the principle of causality and its supporting concepts when designing the processes and systems to create the information.

Timeliness refers to cost information that is recent and consistently available. First, the cost information must be recent. Depending on the situation, this may be minutes, hours, or days to reflect current and ongoing operations. In this regard, the concept of real time should be the default objective.

Second, cost information must be consistently available. Usability requires an effective managerial costing system be in place to generate the information for managers and employees. A cost study—no matter how effectively done, no matter how quickly completed, no matter how well guided with policy and procedures—is never as useful as having information available for day-in, day-out measurement and evaluation. Only through continuous observation and evaluation will cost information be understood to a degree that allows managers to gain confidence that the model reflects the cause-and-effect relationships of the resources, processes, and operations they manage.

Decision Making and Managerial Alignment

The most significant benefit of highly usable cost information is that it provides the ability for managers at all levels to align with the organization's objectives for enterprise optimization. A well-designed managerial costing system eliminates any mismatch between cost information and operations by causally connecting them at the resource level to managerial objectives. This clarity will allow the cost information to be used more effectively and more widely for planning, investing, risk management, performance evaluation, profitability analysis, and other management decisions requiring marginal/incremental information.



Evaluating Costing Approaches

There are many managerial costing approaches—traditional standard costing, activity-based costing, lean accounting, throughput accounting, variable costing, time-driven activity-based costing, resource consumption accounting, and many others. The Conceptual Framework for Managerial Costing provides foundational concepts that can be used to (1) evaluate your organization’s managerial costing needs, and (2) identify the strengths and weaknesses of specific approaches. Consider the evaluation of the appropriateness of managerial costing approaches for your organization by reviewing these questions and creating others relevant to your organization:

1. What are your organization’s managerial costing needs to support the range of decisions (strategic to tactical) that the managers will be making?
2. Apply the Modeling Concepts according to how important each is to your organization:
 - **Resource.** Do you need to understand resources and groups of resources specifically or are broad monetary groupings and representations adequate?
 - **Managerial Objective.** Does your organization need insight into the cost of achieving all the objectives it requires of managers throughout the organization?
 - **Cost.** How deep in your organization is the need to understand the relationship between its resources, their capacity, and their actual output in monetary value?
 - **Responsiveness.** Does your organization need to understand its fixed and proportional cost at all levels of its processes for marginal decisions to invest in improvements, special order pricing, make or buy, and other decisions?
 - **Traceability.** How easy will it be to find verifiable transaction records of the data needed to provide managers with the decision support information needed?
 - **Capacity.** How important is it for your organization to understand when capacity limits are being challenged and the options to remedy them? Is it important to understand productive, nonproductive, and idle/excess resource capacity costs?
 - **Work.** Does your organization need the ability to model its processes and connect the work activities directly to the resources doing the work and the intermediate and final products/services the work produces?
 - **Attributability.** How significantly does the allocation of costs without clear causal relationships impair decision making?
 - **Homogeneity.** Does your organization have resources producing the same managerial objective that differ in age, technology, quality, and other aspects of performance?
 - **Integrated Data Orientation.** How well does the financial and cost information in your organization’s financial and operational systems reflect the resources, processes, product/services, and related decisions of managers and employees?
3. Consider the impact on your organization of the framework’s constraints—objectivity, accuracy, verifiability, measurability, and materiality. Which of these constraints are most important, and how do you effectively and efficiently balance them to minimize the negative impact of each constraint?



4. How well does the managerial costing approach provide information on each concept? One key concern is whether important information is readily available in routine calculations available for analysis, or if it requires more extensive time and research, such as special studies due to limited causal relationships inherent in the approach.
5. How well does the managerial costing approach inform on the most significant constraints for your organization?

Conclusion

Guided by the principles of causality and analogy, managerial costing examines the utilization of business resources and related causes to provide a monetary reflection of an organization's operations. An effective causal model applies a thorough understanding of the resources and operations to determine how they support managerial objectives and the execution of an organization's strategy. Once the model provides an operational understanding, cost information based on the principle of causality will provide a very robust representation of the operation in monetary terms. The combination of the operational understanding and the corresponding financial translation provide strong support for management decision making.



Appendix

Strength of Causality

The proper modeling of causality in managerial costing necessitates a distinction between the strong and weak forms of applying the principle.

The Strong Form refers to instances where the relationship can be explicitly quantified. That is, a *requisite dependency* exists between an output (e.g., 250 simulator hours) and an input (e.g., 50,000 kilowatt hours (kWh) required to run the simulator for 250 hours).

The Weak Form exists when the input-output relationship can't be quantified but an association nevertheless clearly exists. For example, a machine is dedicated to making products A and B (two products composing a product group). What is the relationship of the machine's excess/idle capacity costs to products A and B? The cost for the machine had to be incurred to make products A and B, but the relationship between the products produced and the machine's idle time can't be quantified. **The proper treatment of the principle of causality—in both its strong and weak forms—is important to enterprise optimization and managers'**

Modeling Capacity

Capacity is a key characteristic of all resources. Two types of capacity inputs are recognized:

1. **Capacity provision** inputs are required to enable output commitment even if no output is generated in the end. A resource's capacity provision costs are the costs of the fixed input quantities it must consume to meet its committed capacity. Once a commitment has been made to provide a certain level of output, the associated capacity provision costs can't be avoided until a decision is made and action is taken to eliminate the capacity.
2. **Capacity usage** inputs are those additional inputs—over and above capacity provision inputs—incurred to produce actual output. Capacity usage costs are the costs of proportional inputs consumed in producing output.

Assignment of all capacity costs, from both the provision and usage inputs, is a function of the denominator volume used to calculate the resource's output cost rates. Actual capacity usage inputs consumed will reflect actual output generated. The assignment of capacity provision inputs (and their costs) is more challenging because the causal relationship is not typically as strong. They require a denominator volume that will appropriately reflect both the strong and the weak forms of causality.

If planned output is used as the denominator for rate determination, all capacity provision costs are assigned to products consuming the output. In this case, common fixed costs (costs that have a very weak or no consumption relationship with a specific output, such as excess/idle capacity) are assigned to products in a manner inconsistent with the principle of causality. This arbitrarily spreads some capacity provision costs and compromises managers' cause-and-effect insights.



Therefore, the denominator used to assign capacity provision costs must reflect the following:

- When resource capacity is applied to produce a product or service as well as when the resource remains unapplied.
- Capacity provision inputs and their costs as relating to both applied and unapplied capacity.

Applied capacity is defined as productive capacity (time spent making product) and nonproductive capacity (time for setups, planned and unplanned maintenance, rework, etc.) that can be causally related to a specific output with a consumption relationship. Unapplied capacity includes all idle/excess time and nonproductive capacity that does not have a strong causal relationship to a specific consuming objective. Capacity resource's costs in a causal manner to support managers' analogous activities. It is clear that capacity provision costs should be assigned to a resource's entire period of availability. Therefore, capacity provision costs for idle/excess resource time should not be assigned to productive output but should instead be handled in accordance with the concept of attributability. For optimization purposes, theoretical capacity is the appropriate denominator for assigning capacity provision costs to the consumers of capacity. Any other denominator, including practical, budgeted, or normal capacity, will assign some unapplied capacity and its provision costs arbitrarily to the outputs produced.

CAPACITY DEFINITIONS

Idle/Excess Capacity: Capacity not currently scheduled for use. Idle capacity has three forms: not marketable (no exists or management made a strategic decision to exit the market), off limits (capacity unavailable for use), and marketable (a market exists but capacity is idle).

Nonproductive Capacity: Capacity not in a productive state or not in one of the defined idle states. Nonproductive capacity includes setups, maintenance, standby, scheduled downtime, unscheduled downtime, rework, and scrap. Nonproductive capacity should be minimized.

Productive Capacity: Capacity that provides value to the customer and is the reason an organization acquired the resource. Productive capacity is used to change a product or provide a service, results in the delivery of good products or services, and is used for process or product development.

Theoretical Capacity: The full period a resource is available based on ownership rights or contract agreements. Buildings and equipment are typically available 24 hours a day, 365 days a year. Human resources are typically available for an agreed upon number of hours per week. Overtime is an additional resource when used.

Source: Thomas Klammer, ed., *Capacity Measurement and Improvement: A Manager's Guide to Evaluating and Optimizing Capacity Productivity*, 1996.