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Enterprise optimization

A framework that seamlessly integrates management accounting's principles with significant advantages for managers.

By Gary Cokins and Anton Van der Merwe

What does optimizing an organization mean? The phrase "enterprise optimization" is a recent addition to the management accounting lexicon. Although a cursory review of current accounting textbooks reveals the use of terms like enterprise resource planning (ERP), enterprise risk management (ERM) and enterprise performance management (EPM), these books provide only a passing mention of the general concept of optimization and no mention of enterprise optimization. To address this void, this article clarifies the concept by providing a definition for enterprise optimization and discussing management accounting's role.

Approaches and tools in management accounting abound, and answers to managers' decision-support questions are often conflicting. This leads to a credibility crisis for the management accounting profession and to an inability for it to consistently support optimal decision outcomes. There is often confusion about which management accounting approaches and tools to use. Fortunately, the profession has taken significant steps in recent years to adopt principles for management accounting that will go a long way toward alleviating this problem. These principles are causality,

which governs cost modeling and analogy, which governs the use of cost information [1].

Enterprise optimization provides a framework that seamlessly integrates management accounting's principles with significant advantages for managers. These principles provide the ability to resolve management accounting's dilemma and restore the profession as managers' optimization ally. Such a manager- (customer-) and optimization-centric approach to the profession's broader purpose requires that the topic be addressed from the perspective of what managers are tasked to accomplish.

What Managers are Tasked to Do

Managers are tasked to achieve strategic objectives. If they fail, there are typically adverse consequences, as evidenced by a 14 percent annual CEO replacement rate in the world's largest 2,500 public companies [2]. To achieve strategic objectives, managers must acquire resources, invest in infrastructure and technology, and deploy and apply all of these inputs effectively and efficiently. Essentially, managers are increasingly challenged to pursue frugal acquisition and consumption of inputs to produce desired outputs and to trade them profitably (or in the case of public sector organizations, accomplish their mission economically).

In reality, of course, the optimization of an enterprise's shareholder wealth creation process is not as simple as it sounds. The picture changes drastically when one adds a dynamic environment, competitive pressures, a power shift from suppliers to customers and their preferences, the organization's own disposition (e.g., its strengths, weaknesses, and culture), the need for managers to commit to pursuing one of many probable outcomes, and finally, the need for them to achieve the desired result.

In the quest to achieve enterprise strategic objectives, managers are required to juggle many different and often competing actions and priorities. This quest is graphically depicted in Figure 1. Some confuse ERP software systems as the ultimate solution to enterprise optimization. ERP as a technology-based tool can contribute, but much broader than ERP are the entrepreneurial actions of planning, simulation, defining and identifying alternatives, analyzing them, and selecting an optimal outcome for which managers are responsible. This intellectual and entrepreneurial aspect of the overall optimization equation is arguably the most critical in wealth maximization.

To be successful, managers need information related to at least four primary areas of the value creation process that they are required to influence, manage and improve: 1. sourcing the resource markets, 2. the application of inputs in the conversion process, 3. resultant outputs and their cost, and 4. the profitable application of outputs in selected target markets and market segments.

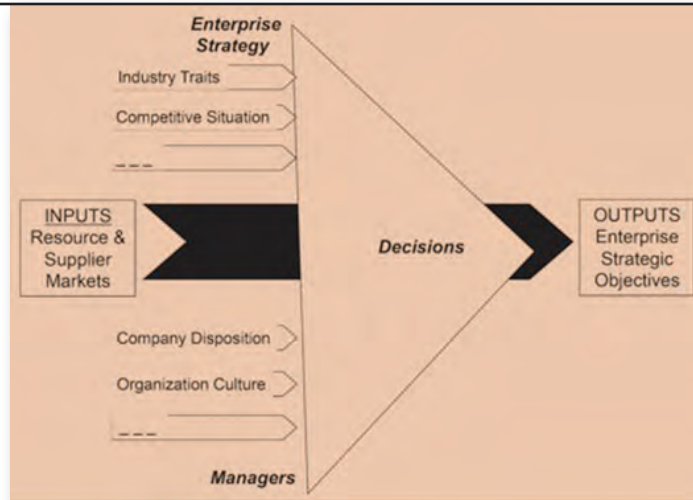


Figure 1: What managers are tasked to do.

The focus on current operations as the foundation for optimization information is essential for the following three reasons:

- First, at any point in time, the enterprise's current investments (i.e., resources deployed), its value chain, its products/services and its market segments and customers equate to the status quo. Collectively, they are what managers are tasked to use to achieve strategic objectives.
- Second, whenever change is to be introduced, managers begin with the status quo as the baseline in their decision-making (i.e., any change must demonstrate a net incremental gain).
- Third, in evaluating decision alternatives, the manager's best guidance as to future outcomes is provided by understanding the cause-and-effect relationships inherent in the wealth creation process they are attempting to influence and improve (i.e., optimize).

For the purposes of this article, enterprise optimization is defined as the pursuit and realization of an organization's strategic objectives with the least amount of total resources in a dynamic and uncompromising environment. This pursuit maximizes long-term shareholder/stakeholder wealth creation. Enterprise optimization insights in this article invariably lead to questions about the role management accounting plays in supporting managers. It has not always been easy to describe such an overarching role and purpose for the profession. Until recently there was no consensus and little agreement in the management accounting community as to a common foundation for all approaches and tools for enterprise optimization.

Steps to Right the Ship

The management accounting profession has recognized what ailed it in the period of unprecedented expansion

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and entrepreneurship during the past few decades was a lack of guiding principles. Only a set of guiding principles can corral the diverse approaches that have emerged over the last three decades and guide their optimal application in practice. However, one key question remains: How does management accounting's overarching purpose tie into the set of adopted principles?

Over the years, management accounting has been attributed to many purposes. These included:

- inventory valuation and product costing for external reporting [6];
- valuing activities and products for internal decision support;
- performance measurement and benchmarking;
- influencing people's behavior; and
- shaping strategy and helping in its execution.

All of these purposes find their best application in (and their proper emphasis under) an umbrella of enterprise optimization.

To clarify two key terms that are often confused, financial accounting for external reporting deals with after-the-fact valuation; in contrast, management accounting for internal use takes a proactive stance toward value creation. This important distinction notwithstanding, the management accounting profession needs to frame its purpose more robustly. It is therefore with an air of optimism that the authors welcome the profession's adoption of a set of guiding principles.

Our optimism stems from the fact (as we will demonstrate later) that management accounting's adopted principles transition seamlessly into managers' optimization endeavors, and they make the management accounting profession more manager-centric. Moreover, the principles resolve debates about which management accounting approach is best. Guiding principles will unveil what might be self-interested approaches promoted by small communities, such as management consultants or software vendors.

The broader enterprise optimization view, along with the principles management accounting has adopted, form the only rational approach for the profession to regain the standing it should ideally enjoy. Against this proposed backdrop, a closer look at the nature of enterprise optimization will help crystallize how management accounting's principles of causality and analogy serve this purpose.

Enterprise Optimization: Context, Aim and Scope

Managerial decisions that select optimal outcomes are the primary drivers for achieving strategic objectives in an optimum manner. In turn, decision-making is influenced by three characteristics of a company's optimization environment: context, aim and scope.

The context of optimization decisions. As indicated in Figure 1, all optimization decisions occur within an industry environment – a competitive situation and the company's own current condition and disposition. This is the company's optimization context, and it determines the nature and frequency of the types of decisions its managers will make. For example, within context, 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 another store on a corner one block away). 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 vis-a-vis Airbus).

Optimization context provides management accounting with a frame of reference and dictates the focus of management accounting for supporting managers. One aspect is determining which resources' costs are decision-relevant for including or excluding. This depends on whether their capacity is impacted and adjustable. For example, in a distribution business, operational insights are critical to achieving internal efficiency (e.g., receiving, picking, packing, and shipping) and to understanding what a profitable minimum order size is. On the other hand, in an outsourcing business, the mix of products and services (e.g., application hosting, infrastructure, and business processes) structured and priced for a particular deal is often critical. These examples reveal the importance of decision-makers understanding what it entails to arrive at an optimum outcome in different contexts – insight for which management accounting should be the primary contributor.

The aim of an optimization decision. The aim of optimization decisions should not be confused with the decision's outcome. 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) [7]. Adaptive actions alter the company's existing strategy/plan because changes in the internal or external environments nullify prior assumptions. An example is an airline deciding on an earlier implementation of a fleet replacement program (to improve fuel efficiency) due to the effects of global energy demand on crude oil prices.

In contrast, corrective actions are steps taken to bring an organization back on track with its existing objectives. For example, a competitor introduces a new product, so corrective actions are required to realize the planned market share target, which has fallen short.

The distinction between adaptive and corrective actions is important for management accounting because of different information requirements for each.

Adaptive actions are dependent on information that will assist managers in making extrapolations and projections as to future outcomes. Managers are best served by cause-and-effect information with appropriate structure and detail to facilitate their forward-looking activities. In contrast, corrective actions are triggered by information providing insights into the deviation of actual results from the plan or target. Here, the information focuses on actual results and their causes and effects in order to help managers understand what transpired and to guide appropriate corrective actions.

The aims of optimization decisions require management accounting to support planning [8], simulation, measurement and analysis through cause-and-effect insights. The management accounting principle of causality is therefore essential to the effective support of managers' optimization actions [9]. The historical data are less important than the relationships. The relationships are essential for modeling the future and understanding the past.

Optimization decisions and their scope. *Optimization scope* is comprised of two dimensions: breadth, which is the value chain of areas targeted by a decision; and depth, which is the cost of insights required to fully understand a decision's impact/effects and all of the relevant costs for a decision. Figure 2 demon-

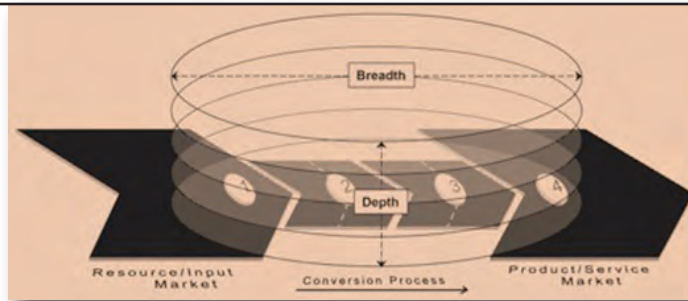


Figure 2: The four optimization areas and optimization scope [10].

strates how these two dimensions relate to the wealth creation process.

Breadth consists of the four value chain optimization areas:

1. **Sourcing resource/input markets.** Here, decisions consider new technologies (along with methods and worker/equipment resources), and they strive to maximize limited capital resources through asset replacement, investment, sourcing and outsourcing.
2. **Applying resource/inputs in conversion.** Efficiency is emphasized (the process of doing things right – and decisions address resource application, utilization, realignment or

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• Jump-Diffusion model:

$$\sum_{j=1}^d \sigma_{ij} dW_j(t) + d \left(\sum_{j=1}^{N(t)} (Y_j^i - 1) \right), \quad i = 1, \dots, d.$$

• Geometric Brownian motion is a special case of the above model:

$$dU_i(t) = \mu_i dt + \sigma_i dW(t), \quad U_i(0) = 0.$$

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redeployment, process improvements, eliminating waste, and capacity management.

3. **Producing outputs.** Effectiveness is the focus (doing the right things and producing the right outputs). Examples 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, the costs-to-serve these, product/service mix, product discontinuance, entering new markets, creating new products/services for existing markets and market mining. More incisive decisions typically span more than one value chain area. An example is the introduction of the iPad – a new product paving a new market and requiring new technologies and inputs to produce. For management accounting, the breadth of optimization decisions dictate the types of cost objects to use and for which to calculate values (that is, how management accounting information must be segmented) [11].

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 concepts that provides insight into the level of optimization influence. The cost concepts include:

- throughput costs (when deciding to produce one additional unit within the relevant range) [12];
- incremental costs (the difference in total costs between two alternatives in a decision);
- short-term variable/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) [13]; and
- full costs (for strategic decisions, such as a tool manufacturer entering the South American market by establishing a plant in the region) [14].

It is critical that cost information for these cost concepts be compiled based solely on the principle of causality. For management accounting, the various cost concepts dictate the level of resource consumption and cost modeling detail that must be provided. As already stressed, the principle of causality is essential as the basis for cost information. Managerial activities are heavily

dependent on causal insights, and the accompanying monetary information that managers rely on must naturally be based on the same principle. In the outsourcing example, insights key to success are resources' (servers and network infrastructure) attributable costs and the demand patterns for resource outputs (e.g., processing power and bandwidth) and their incremental costs.

Management information needs are diverse and wide ranging. Apart from context, aim and scope, one can add macroeconomic projections, qualitative market intelligence, indicators on employee morale, quantities of goods and services consumed and their monetary implications. The length of time for consideration is also often a factor. For example, for some decisions, the length of the planning time horizon governs the speed at which capacity is adjustable. For other decisions, the length of time is the time the customer is prepared to be on hold on the phone. Managers are required to collectively weigh any of these pieces of information as they relate to a particular decision and consider the influence on potential outcomes.

Causality: Management Accounting's and Optimization's Crucial Principle

In managers' enterprise optimization endeavors, management accounting plays a crucial role in providing a monetary view (i.e., with currency as a common denominator) for the evaluation of often diverse decision alternatives and the selection of an optimum outcome. The profession ultimately needs to be seen as managers' "optimization ally." The foundation for this has now been poured; management accounting's principle of causality underlies all managerial activities.

Management accounting is invariably associated with monetary information, but a monetary view is a representation of physical events in operations. A number of other aspects in management accounting are heavily dependent on the principle of causality to effectively support managers. Consider the following examples:

- modeling current operations that serve as the basis for management information;
- insights into quantitative input and output cause-and-effect relationships;
- segmentation of management accounting information to maximize managers' cause-and-effect insights;
- accommodating managers' planning, simulation, measurement and analysis needs;
- decision support (helping managers draw inferences with regard to changes to the existing resources, value chain, products/services, market segments and customers);
- manager activities and actions that extrapolate current cause-and-effect insights into a new

Decisions

cover target markets and market segments, the costs-to-serve these, product/service mix, product discontinuance, entering new markets, creating new products/services for existing markets and market mining.

plan (i.e., managers' analogous responsibilities) [15]; and

- causal cost assignment and the resultant monetary value of cost objects (many managers are aware of the gross cost distortions that result from arbitrary cost allocations or cost allocations based on excessively broad averages, like number of units produced or direct labor input hours, that do not reflect causality) [16].

Causal insights permeate managers' optimization activities, whether adaptive or corrective in nature. Causality is therefore fundamental to management accounting – so much so that its absence undermines any effort whatsoever to support managers.

Conclusion

It was considered a significant breakthrough when, almost a century ago, the concept of “different costs for different purposes” was proposed as the appropriate way to consistently provide managers with the decision support information they need [17].

Astonishingly (and anticlimactically), the management accounting profession was never able to fully comply with its own axiom. Add to this the explosion in new approaches and tools in the 1980s and 1990s, along with the contradictions among the various approaches and heated debates, and one gets a sense of the dire straits the management accounting profession was in at the turn of the last century.

Clearly what the profession needed was neither more costing approaches nor a hodgepodge of existing approaches applied without regard for a set of guiding principles. The problem of conflicting costing approaches is resolved by management accounting's principles. As described earlier, those principles also underlie enterprise optimization and managers' related activities. Regardless of the extent of optimization context, aim and scope for any particular company, a single set of enduring principles underlie managers' efforts and the information they need to be successful in their optimization endeavors. Causality is the most important of the principles.

Fortunately, the profession recognized the need for a set of guiding principles, but it arrived at this insight from a particular perspective – the need to deal with internal conflict, which resulted from the inconsistencies brought about by diverse and contradictory approaches. This is an important recognition. However, we (the authors) propose that management accounting's adopted principles go far beyond having merely such an internal focus and benefit. The principles also govern enterprise optimization, which is arguably management accounting's overarching objective. From this perspective, management

accounting's adopted principles have opened a door of restoration that the profession could only have dreamt of a few years ago. **ORMS**

Gary Cokins (gcokins@garycokins.com) is an internationally recognized expert, speaker and author in advanced cost management and enterprise performance and risk management systems. He is the founder of Analytics-Based Performance Management LLC, an advisory firm located in Cary, N.C.

Anton Van der Merwe (antonvdm@altavia.com) specializes in ERP system implementations with an emphasis on management accounting and decision support. A version of this article appeared in *Cost Management*.

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9. Van der Merwe, A., “Management accounting philosophy II: Cornerstones for restoration,” *Cost Management*, September/October 2007, pp. 26-33.
10. Van der Merwe, A., “Management accounting philosophy III: Filling up the moat,” *Cost Management*, November/December 2007, pp. 20-29.
11. In management accounting, cost objects are the outputs that benefit from consuming resources and for which managers have an optimization need to plan, measure and analyze. Examples of cost objects are resources, work activities, products, service lines, distribution channels and customers.
12. 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.
13. Shillinglaw, G., “The concept of attributable cost,” *Journal of Accounting Research*, 1963, pp.73-85. Attributable cost is the most complete cost concept based on the principle of causality.
14. Often referred to as fully absorbed or fully loaded costs. This cost concept, by its very nature, contains some non-causally assigned costs, and the use of this information should be limited to strategic decisions of significant breadth and depth.
15. Analogy is the second principle underlying managers' optimization endeavors and refers to those entrepreneurial tasks that use current or anticipated cause-and-effect insights to select from among a number of alternatives the one that is most likely to best satisfy strategic objectives (i.e., managers must apply the principle of analogy in extrapolating to possible outcomes in their adaptive and corrective actions).
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