

The Demand Driven Adaptive System (DDAS)

The Case for a New System of Supply Chain Management

By Chad Smith and Carol Ptak

The purpose of this document is to introduce the Demand Driven Adaptive System (DDAS) – an organizational structure and operating method designed for the complex volatile circumstances that organizations must compete in today. Conventional management practices have tremendous amounts of inertia driven by software, consulting, accounting and academic experts. Today, it seems at almost every level of larger enterprises, doing what truly makes sense proves to be nearly impossible.

The basic physics, mathematics and economic principles are undeniable. Companies must adapt and change or their very existence is threatened. Considering this astonishing data from the Harvard Business Review:

“We investigated the longevity of more than 30,000 public firms in the United States over a 50-year span. The results are stark: Businesses are disappearing faster than ever before. Public companies have a one in three chance of being delisted in the next five years, whether because of bankruptcy, liquidation, M&A, or other causes. That’s six times the delisting rate of companies 40 years ago. Although we may perceive corporations as enduring institutions, they now die, on average, at a younger age than their employees. And the rise in mortality applies regardless of size, age, or sector. Neither scale nor experience guards against an early demise.

We believe that companies are dying younger because they are failing to adapt to the growing complexity of their environment. Many misread the environment, select the wrong approach to strategy, or fail to support a viable approach with the right behaviors and capabilities.” ([Martin Reeves, Simon Levin, and Daichi Ueda, Harvard Business Review, January-February 2016](#))

Companies must continue to drive change in order to survive. But what to change to? How to change and drive adaptation? Is there a safe and effective path to transform a company from an operating strategy developed in the 1950’s measured by accounting principles developed in the 1930’s to an agile demand driven enterprise capable of staying ahead of today’s hypercompetitive market? This has been the focus of the Demand Driven Institute since 2011 – to articulate a comprehensive methodology that enables a company to sense changes from the market and adapt planning and production in real time resulting in sustainable maximum ROI.

First it is necessary to understand the fundamental principle upon which the Demand Driven Adaptive System is based. The DDAS is featured in the upcoming book [Demand Driven Material Requirements Planning](#) (Ptak and Smith, Industrial Press, 2016)

Flow – Common Sense but Not Common Practice

The broad based appeal of “flow” seems to be obvious. George Plossl, a founding father of MRP, in the second edition of Orlicky’s Material Requirements Planning (McGraw-Hill, 1994) said that “all benefits are directly proportionate to the speed of flow of information and materials.” Improvement gurus such as Taiichi Ohno, Eli Goldratt and W. Edwards Deming founded entire improvement disciplines on the concept of flow. Early industrial pioneers such as Henry Ford and Frederick Taylor built large manufacturing empires based on this concept. F. Donaldson Brown defined the basics of management accounting on the concept of flow. Flow just makes common sense.

Plossl’s first law can be illustrated by a very simple equation featured in the book [Demand Driven Performance – Using Smart Metrics](#) (Smith and Smith, McGraw-Hill, 2013). The equation shows that changes to flow directly yield changes to cash velocity which in turn influences ROI. This equation is easy to grasp for people at any level of the organization and links the velocity at which we move information and materials directly to ROI. Yet, if flow is so important and intuitive why does its effective enterprise-wide implementation prove to be so elusive to most organizations?

$$\Delta\text{Flow} \rightarrow \Delta\text{Cash Velocity} \rightarrow \Delta \left(\frac{\text{Net Profit}}{\text{Investment}} \right) \rightarrow \Delta\text{ROI}$$

There is an important caveat to this equation. Organizations cannot just quickly push large amounts of data and materials and expect to automatically reap huge benefits. In fact, the only way that data can become valuable information and those materials can be converted to cash is to ensure that both are “relevant”. Thus Plossl’s law must be amended to “all benefits are directly proportionate to the speed of flow of RELEVANT information and materials.”

With the inclusion of the word relevant, an expansion to the above equation is necessary. This expansion was also featured by Smith and Smith in [Demand Driven Performance – Using Smart Metrics](#). This new component of the equation brings to light why an organizational strategy based on flow proves to be so elusive. It explains the frustrations with Lean, Six Sigma and Theory of Constraints (TOC) implementations and why they so often end up being simply lip service or merely a “program of the year” in larger organizations.

$$\Delta\text{Visibility} \rightarrow \Delta\text{Variability} \rightarrow \Delta\text{Flow} \rightarrow \Delta\text{Cash Velocity} \rightarrow \Delta \left(\frac{\text{Net Profit}}{\text{Investment}} \right) \rightarrow \Delta\text{ROI}$$

What directly impedes better flow across organizations is variability. The more variable an environment; the worse the flow. In our more complex and volatile world, variability seems to be increasing at a faster rate than we can compensate for it. So, must we give up the quest for flow? Is it simply a pipe dream to never be achieved like the pursuit of perfection? The key to managing variability is to create visibility to relevant information. When information is irrelevant, the picture is distorted, variability is exacerbated, flow breaks down and ROI is adversely impacted. Thus, the starting point for any company to transform into a flow-based model is comprehending and gaining visibility to relevant information.

The Prerequisites for Relevant Information

There are four prerequisites to gaining visibility to relevant information that promotes and protects flow:

- 1. Understanding Relevant Ranges.** The concept of relevant range comes from economics and management accounting. Relevant range refers to the time period in which assumptions are valid. There are two specific relevant ranges that a business executive must understand and connect in a bi-directional adaptive fashion in order to make flow a sustainable and effective reality. These two relevant ranges are the Strategic Relevant Range and the Tactical Relevant Range. The Strategic Relevant Range is typically measured in monthly, quarterly and annual time buckets that covers business planning and strategic direction setting. The Tactical Relevant Range covers the hourly, daily and weekly time buckets encompassing normal operations. The assumptions and information that are valid and relevant within these ranges will differ dramatically. For example:
 - Forecasts are relevant for the strategic range, not the tactical range
 - Fixed expenses are variable in the strategic range, not the tactical range
 - Work order delays are relevant for the tactical range, not the strategic range
 - A machine breakdown is relevant for the tactical range, not the strategic rangeTrying to force fit assumptions (and metrics derived from those assumptions) into an inappropriate range directly results in distortions to relevant information and materials and a break down in flow.
- 2. Flow-Based Operating Model.** There are no shortages of flow based operating models that have been proposed within the last fifty years. The very essence of Material Requirements Planning (MRP) is to perfectly synchronize supply and demand while netting inventory to zero. Lean proposes a flow based model utilizing kanbans, supermarkets and heijunka boards. Theory of Constraints advocates yet another flow based model using drum-buffer-rope scheduling and time, capacity and stock buffering. Yet these flow-based models tend to have many tenuous, even conflicting assumptions, limiting each from fully achieving expectations. Most planners use spreadsheets to work around the MRP system to determine what to really order and when. Most Lean and TOC implementations are isolated to specific areas of an organization and constantly struggle against imposed corporate metrics and policies as well as the legacy MRP system. Is there a flow-based operating model that can meet all of these diverse requirements and makes sense to all levels of the organization?
- 3. Flow-Based Metrics.** The metrics must take into account the above two prerequisites; the flow-based operating model and the differing relevant ranges. Metrics that are inappropriate and/or directly inhibit the flow of relevant information and/or materials adversely impact ROI. Thus, there must be a set of flow-based metrics for the Tactical Relevant Range and a set of flow-based metrics for the Strategic Relevant Range that are specific to the flow-based operating model.
- 4. Tactical Range and Strategic Range Communication Loop and Integrated Reconciliation.** While the assumptions and information that are relevant for decision making differ between these ranges there is still an absolute need to reconcile them on an ongoing and iterative basis. Strategy must be influenced by operational capability and performance as well as how the model might perform under predicted conditions. Operational capability must be influenced by predicted conditions and/or strategic expectations in future time periods.

These prerequisites define what it means to think, communicate and behave systemically – the only way to protect and promote flow. If an organization and its personnel do not have this “thoughtware” installed, then the flow of relevant information and materials will always be impeded to varying degrees. This directly leads to poorer ROI performance. Thus, before companies invest huge amounts of money,

time and energy into new hardware and software solutions they should first consider investing in the proper thoughtware in order to gain visibility to what is relevant.

When reviewing the common sense of a flow-based strategy and its prerequisites we come to the basic problem statement:

Companies lack an effective organizational model, metrics and a communication system that enables the ability to implement, sustain and evolve flow-based operating models at the complex enterprise level.

This problem has become more acute with the increasing level of complexity, uncertainty and volatility in today's supply chains and the continued drive to keep attempting the optimization of old and inappropriate rules.

The Demand Driven Adaptive System (DDAS)

Taking this all into account leads to a clearly defined need. Companies need an operating model, smarter metrics and a communication system that promotes visibility to the relevant information for the promotion and protection of flow at the enterprise level. They need a blueprint and a step by step path to install appropriate thoughtware. The Demand Driven Adaptive System was designed with this need pinpointed directly. The DDAS enables and sustains a flow based strategy in today's more complex and volatile environments. The Demand Driven Adaptive System is featured in the book [Demand Driven Material Requirements Planning](#) (Ptak and Smith, Industrial Press, 2016).

The DDAS incorporates all of the above defined pre-requisites for relevant information.

1. Tactical and Strategic Relevant Ranges. The DDAS uses a constant system of bi-directional linkages that connect the business strategy to the settings and performance of a Demand Driven Operating Model through the Demand Driven Sales and Operations Planning Process (DDS&OP). The DDAS focuses on the protection and promotion of the flow of relevant information and materials in both the strategic (annual, quarterly and monthly time buckets) and tactical (hourly, daily and weekly time buckets) relevant ranges of decision making in order to optimize return on equity performance as changes occur. Figure 1 depicts the DDAS schema that incorporates both strategic and tactical relevant ranges.

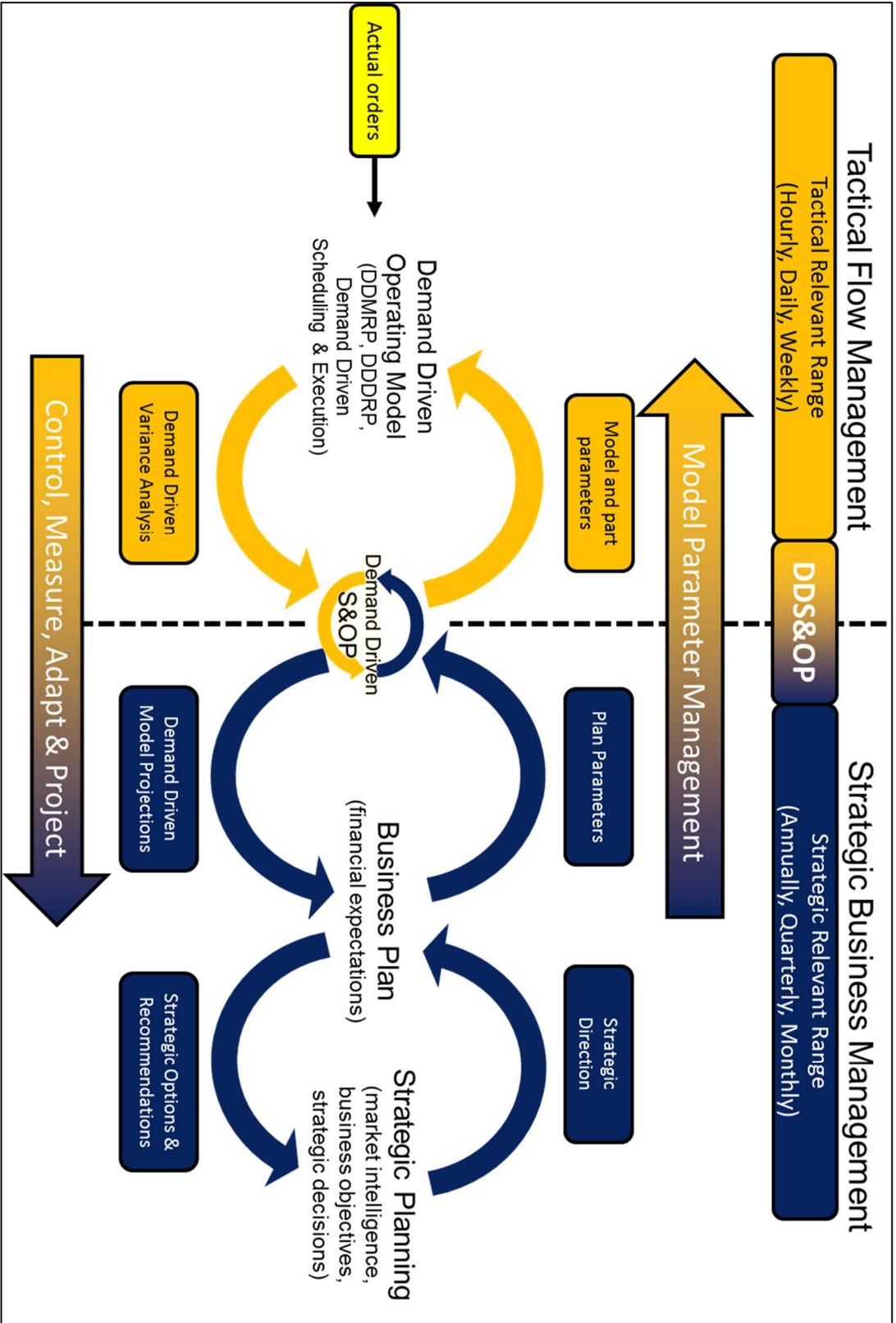


Figure 1: The Demand Driven Adaptive System

Strategic Planning and the Business Plan are developed and managed in the strategic relevant range while the operating model is managed in the tactical relevant range. The two are integrated and reconciled in a bi-directional fashion at the point called Demand Driven S&OP.

2. Flow-Based Operating Model. The DDAS incorporates a flow-based approach called the Demand Driven Operating Model. A Demand Driven Operating Model (DDOM) is a supply order generation, operational scheduling and execution model utilizing actual demand in combination with strategic decoupling and control points protected by stock, time and capacity buffers in order to create a predictable and agile system that promotes and protects the flow of relevant information and materials within the tactical relevant operational range (hourly, daily and weekly). A DDOM's key parameters are set through the Demand Driven Sales and Operations Planning process to meet the stated business and market objectives while minimizing working capital and expedite related expenses. The DDOM schema is depicted in Figure 2.

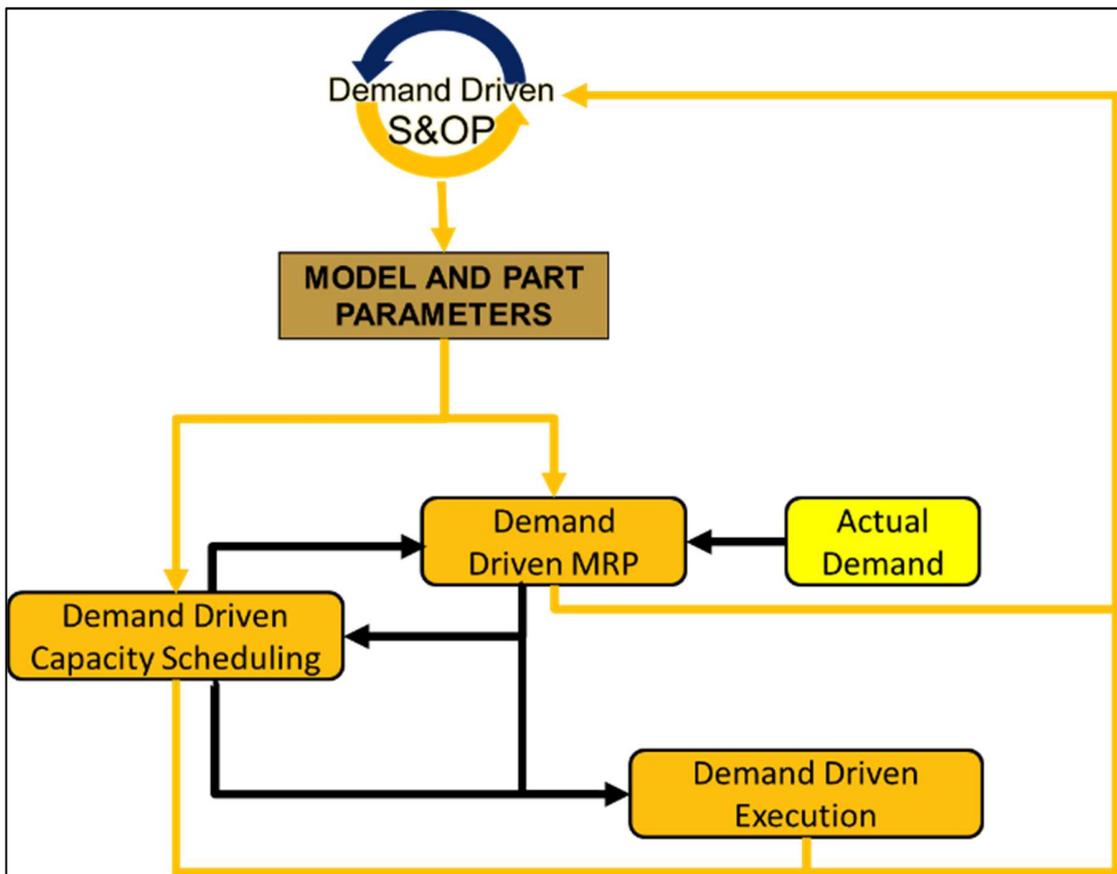


Figure 2: The Demand Driven Operating Model

The heart of the DDOM is the innovative method of supply order generation and execution known as Demand Driven Material Requirements Planning (DDMRP). DDMRP utilizes strategically determined decoupling point buffers to compress lead times and minimize the distortion to relevant information (transfer and amplification of demand signal distortion) up the supply chain and the distortion to relevant materials (supply continuity variability) down the supply chain. Detailed resource scheduling is accomplished through Demand Driven Scheduling. Demand Driven Scheduling utilizes the strategically determined placement and scheduling of

control points protected by a combination of stock, time and capacity buffers. Demand Driven Execution is the management of open supply orders and released manufacturing orders against the real-time status of stock, time and capacity buffers.

3. Flow-Based Metrics. The DDAS uses different metric emphases within the tactical and strategic relevant ranges to promote and protect flow. Tactical metrics emphasize reliability, stability and velocity in operations to determine relevant information and materials in the Tactical Relevant Range. Strategic metrics emphasize system improvement, waste reduction, local operating expense control, total system contribution and additional potential (volume and rate) in order to determine relevant information and materials in the Strategic Relevant Range. Figure 3 displays the tactical and strategic metric objectives in the DDAS.

	Metric Objectives	The Message Behind the Objective
Tactical	System Reliability	Execute to the model, plan, schedule and market expectation;
	System Stability	Pass on as little variation as possible;
	System Speed/Velocity	Pass the right work on as fast as possible;
Strategic	System Improvement & Waste Reduction (Opportunity \$)	Point out and prioritize lost ROI opportunities.
	Local Operating Expense Control	Spend minimization to capture the market opportunity
	Strategic Contribution	Maximize system return according to relevant model factors (volume and rate)

Figure 3: Tactical and Strategic Metric Objectives and Messages

In each case there is a metric objective and a message behind the metric. This allows companies to build business specific metrics that fit these objective and message within their unique Demand Driven Operating Model. This metric suite known as “Smart Metrics” is thoroughly described in the book [Demand Driven Performance – Using Smart Metrics](#).

4. Tactical and Strategic Range Communication Loop and Integrated Reconciliation. A Demand Driven Adaptive System utilizes a Demand Driven Sales and Operations Planning (DDS&OP) reconciliation system. DDS&OP is a bi-directional integration point in a Demand Driven Adaptive System between the strategic and tactical) relevant ranges of decision making. DDS&OP sets key parameters of a Demand Driven Operating Model based on business strategy, market intelligence and key business objectives (strategic information and requirements). DDS&OP also projects the model performance based on the strategic information and requirements and various model settings. Additionally, DDS&OP uses variance analysis based on past model performance with regard to reliability, stability and velocity to adapt the key parameters of its Demand Driven Operating Model and/or recommend strategic alterations to the model and project their respective impact on the business. Figure 4 displays the Demand Driven Sales and Operations Planning schema.

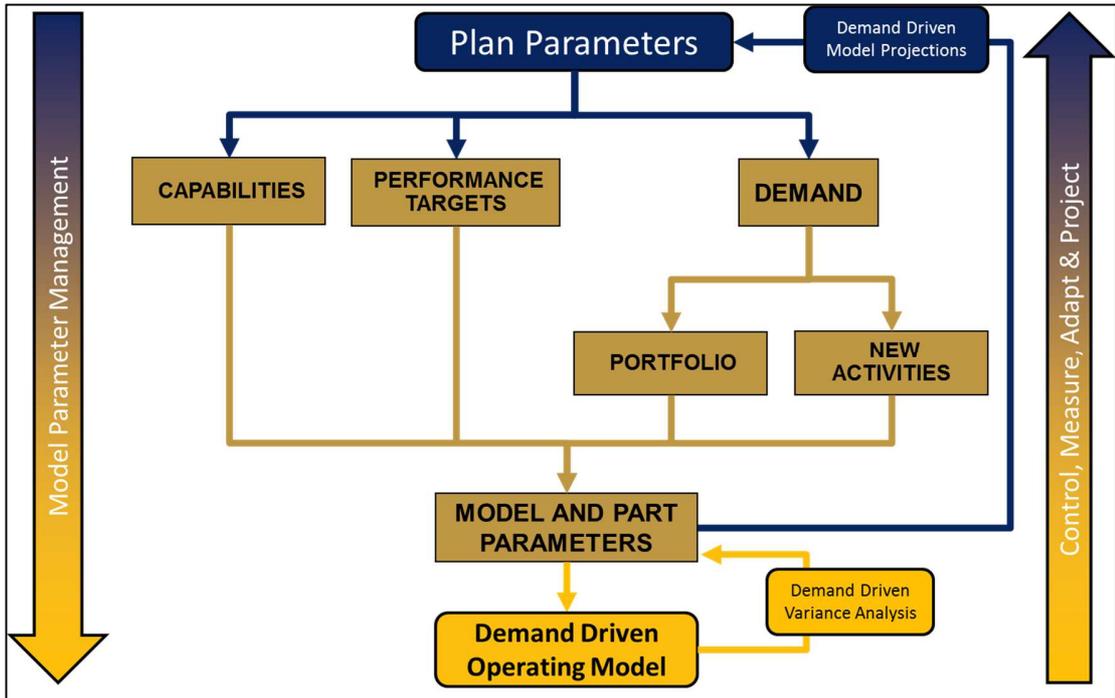


Figure 4: Demand Driven Sales and Operations Planning

Summary

What stands in the way of Demand Driven proliferation is a series of common conventional practices and assumptions in both Operations and Finance that must be understood for what they really are – common nonsense. Optimizing these old and inappropriate rules in this more complex and volatile set of circumstances will only push organizations farther away from embracing flow and encourage devastating amounts of waste.

The Demand Driven Adaptive System is first and foremost about visibility to what is relevant. It recognizes that the only way to effectively implement and foster flow is to enable a company to determine truly relevant information at both the strategic and tactical level. Through that visibility, companies can also strip out what is irrelevant and distortive. This directly leads to a reduction or the mitigation of tremendous amounts of variability – variability that is largely self-imposed by not having access and visibility to what is truly relevant.

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