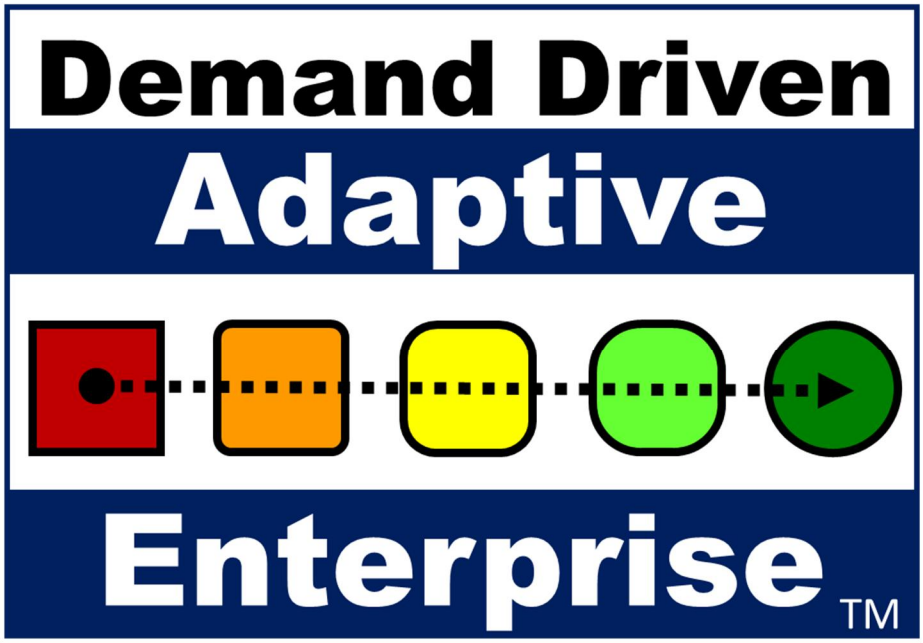
The Demand Driven Adaptive Enterprise Model

The Case for a New System of Enterprise Management



A white paper by the Demand Driven Institute

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The Demand Driven Institute (DDI) was founded by Carol Ptak and Chad Smith, co-authors of the third edition of *Orlicky's Material Requirements Planning (McGraw-Hill, 2011)* and *Demand Driven Material Requirements Planning* (Industrial Press, 2016) in order to proliferate and further develop demand driven strategy and tactics in industry to enable a company to transform from "push and promote" to "position, protect, and pull."

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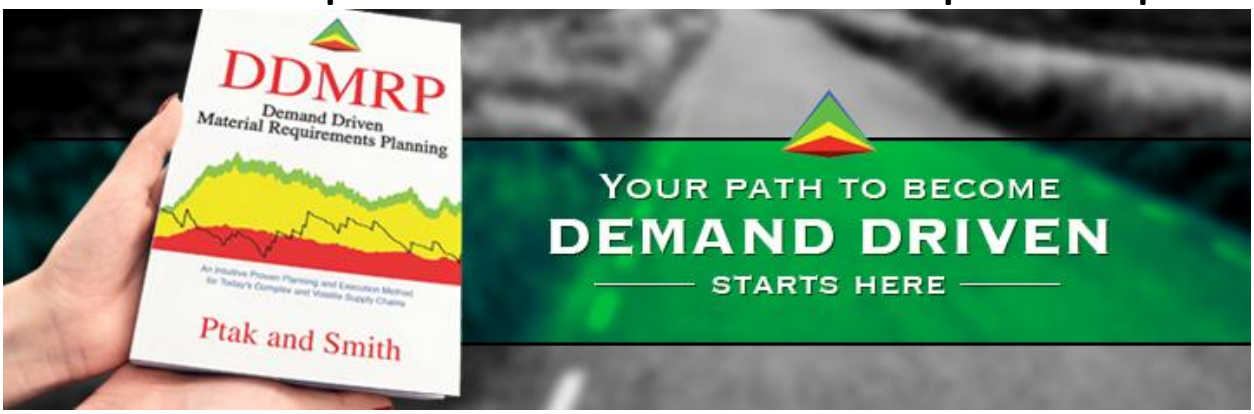


In the 1950's, an innovative planning method was conceived called "Material Requirements Planning (MRP)." MRP changed the world of manufacturing forever. But times have changed – customer tolerance times are much shorter, product variety and complexity have increased, and supply chains have extended around the world. MRP simply was not designed for this environment and is dramatically failing in this "New Normal."

Demand Driven Material Requirements Planning (DDMRP) is a practical, proven and emerging method for supply chain planning and execution that effectively brings this 1950s concept into the modern era. The foundation of DDMRP is based upon the connection between the creation, protection and acceleration of the flow of relevant materials and information and sustained return on asset performance.

Using an innovative multi-echelon "Position, Protect and Pull" methodology, DDMRP helps plan and manage inventories and materials in today's more complex supply network scenarios, with attention being paid to ownership, the market, engineering, sales, and the supply base. It enables a company to decouple inherent forecast error from supply order generation and aligns production to actual market requirements, while promoting higher quality quicker decisions and actions at the planning and execution level. DDMRP is already in use by MAJOR Global 1000 companies.

Demand Driven Material Requirements Planning is THE definitive work on DDMRP.

The Demand Driven Adaptive Enterprise (DDAE) Model

The Case for a New System of Enterprise Management

By Chad Smith, Carol Ptak and Dick Ling

The purpose of this document is to introduce the Demand Driven Adaptive Enterprise (DDAE) model – an organizational structure and operating method designed for the complex and volatile circumstances that define today's supply chain environments. Conventional management practices have tremendous amounts of inertia driven by software, consulting, accounting and academic experts. Many of these practices trace their origins back to the 1930s and 1950s. Yet the world looks nothing like it did at that time. The changing global and industrial landscape is forcing companies to behave differently. Consider this astonishing information 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 adapt and change or their very existence is threatened. 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 financial accounting principles develop in the 1970's and 80'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 improvements to ROI.

"It is not the most intellectual of the species that survives; it is not the strongest that survives; but the species that survives is the one that is able best to adapt and adjust to the changing environment in which it finds itself."

First it is necessary to understand the fundamental principle upon which the Demand Driven Adaptive Enterprise model is based. The DDAE model is featured in the 2016 book Demand Driven Material Requirements Planning (Ptak and Smith, Industrial Press, 2016). Its definition (described in this paper) has since been dramatically expanded. Readers should consider visiting the Demand Driven Adaptive Enterprise page at DDI's website for more information.

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 is 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 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?

No! 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 operating in a flow-based fashion 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:

Prerequisite #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. The assumptions and information that are valid and relevant within these ranges will differ dramatically and these differing ranges will be utilized by different personnel. For example:

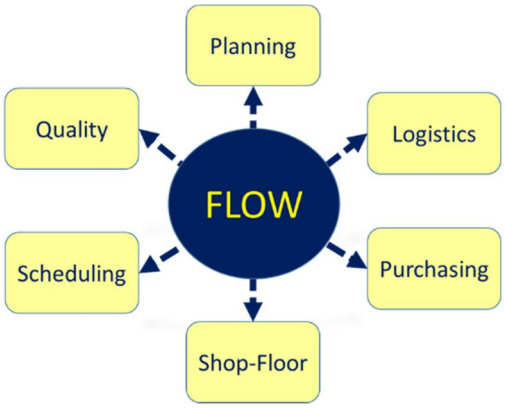
- Forecasts are relevant for the longer range, not the shorter range
- Fixed expenses are variable in the longer range, not in the shorter range
- Work order delays are relevant for the short range, not the long range
- A machine breakdown is relevant in the short range, not the long range

Trying to force fit assumptions (and metrics derived from those assumptions) into an inappropriate range directly results in distortions to relevant information and materials and thus a break down in flow. Three types of relevant ranges will be discussed later in this paper.

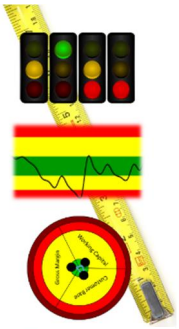
Prerequisite #2: A Flow-Based Operating Model.

A flow-based operating model revolves all operational activity around flow. Flow becomes the common basis for decision making in day to day operations. When we look at the various parts of Operations we can see a clear connection to each of their objectives and flow. First and foremost, policies, metrics and decisions in the operating model should be based on flow – nothing else unifies and aligns the organization in the same way.

Function	Primary Objective
Planning	Synchronize supply and demand
Logistics	Connect sources to consumption points
Purchasing	Ensure material/component availability
Shop-Floor	Execute the schedule
Scheduling	Sequence activity to meet commitments
Quality	Meet specification



Prerequisite #3: Flow-Based Metrics. The metrics must take into account the previous prerequisites; differing relevant ranges and flow-based operating model. Force fitting non flow-based metrics will directly lead to conflicts and distortions throughout the organization – it will obscure what is relevant! Obscuring what is relevant directly leads to more variability which in turn directly inhibits the flow of relevant information and/or materials. Thus, there must be a set of flow-based metrics that connects all relevant ranges in the flow-based operating model.

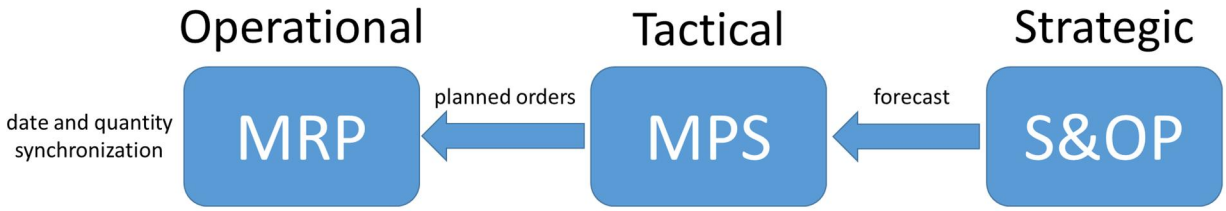


Prerequisite #4: Tactical Reconciliation between Relevant Ranges. While the assumptions and information that are relevant for decision making differ between these ranges there is still an absolute need to reconcile them on an ongoing and iterative basis. Strategy must be influenced by operational capability 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.

Convention and the Prerequisites for Relevant Information

The conventional approach to managing a company involves strategic, tactical and operational perspectives. Strategy is typically set by a Sales and Operations Planning (S&OP) process. S&OP feeds a forecast to a Master Production Schedule (MPS) which is essentially a tactical filter to prevent the forecast from driving MRP directly. The MPS is a statement of what can and will be built recognizing available capacity. The MPS then sends planned orders to Material Requirements Planning (MRP) for supply order generation involving date and quantity synchronization through a level by level explosion.



Convention and Relevant Ranges:
The conventional approach definitely understands the need for relevant ranges but fails to manage them properly. One clear example is using fully absorbed unitized cost metrics for operational decisions. Fully absorbed unit cost means that all of the manufacturing costs are absorbed by the units produced. In other words, the cost of a finished unit in inventory will include direct materials, labor and overhead

costs. Direct materials are variable costs. Variable cost is tied to unit volume NOT resources. Variable costs rise and fall with unit volume but DO NOT change on a per unit basis. Labor and overhead are fixed costs. Fixed costs are NOT affected by changes in activity level within a relevant range. Using fully absorbed unit costing metrics creates the false impression that fixed costs vary within the short range. They do not and that is why they are called fixed costs. This causes a significant distortion in relevant information. Another example is convention's reliance on forecasting. Predicting market behavior and conditions is a necessary component for guiding a business to success. Bringing those predictions into the immediate operational range, however, creates immense amount of distortion and waste. There are three rules about forecasts:

1. They start out wrong.
2. The more remote in time the extend the more wrong they are
3. The more detailed they are the more wrong they are.

Despite these facts convention uses forecasts to drive actual supply orders. This means that capacity, capital, materials and space are committed to signals that have significant rates of error associated with them. This is the very definition of irrelevant information and why forecasts are irrelevant in the short range.

Convention and Flow-Based Operating Models:

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. It is fair to say that convention has been lacking a practical, sustainable and adaptable flow-based operating model that meets the needs of all operational players.

Convention and Flow-Based Metrics:

Make no mistake, there are important flow-based metrics in use in conventional approaches. Metrics like on-time delivery and fill rates are flow-based. Their use, however, is countered with conflicting cost-based metrics. These conflicting metrics obscure what is relevant and introduce self-imposed variability within organizations as personnel oscillate between protecting flow and protecting cost performance. Ironically, when flow is promoted and protected, costs are under control. The inverse, however, is not true.

Convention and Tactical Reconciliation:

In convention tactical reconciliation is not bi-directional – it is a one way street. This limits the ability to drive any meaningful adaptation in the system and additionally, reconciliation is incredibly painful. Every MRP run results in massive cascading schedule changes as date and quantity changes at higher levels effect all connected lower level components. Monthly S&OP updates create massive shifts at the beginning of every month that are compounded by the MRP run. In convention this make tactical reconciliation more akin to a cycle of tactical demolition and reconstruction.

This brings us to the real problem statement regarding a company's inability to embrace flow:

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

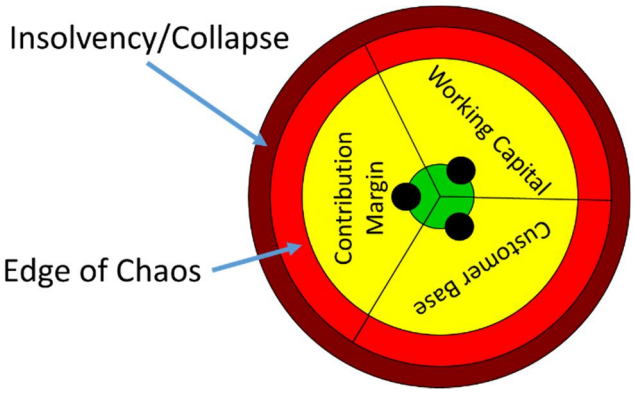
This problem has become more acute with the increasing level of complexity, uncertainty and volatility in today's supply chains and the continued drive to keep attempting the optimization of old and inappropriate rules. We must have a framework to utilize the appropriate thoughtware.

Striving for Coherence

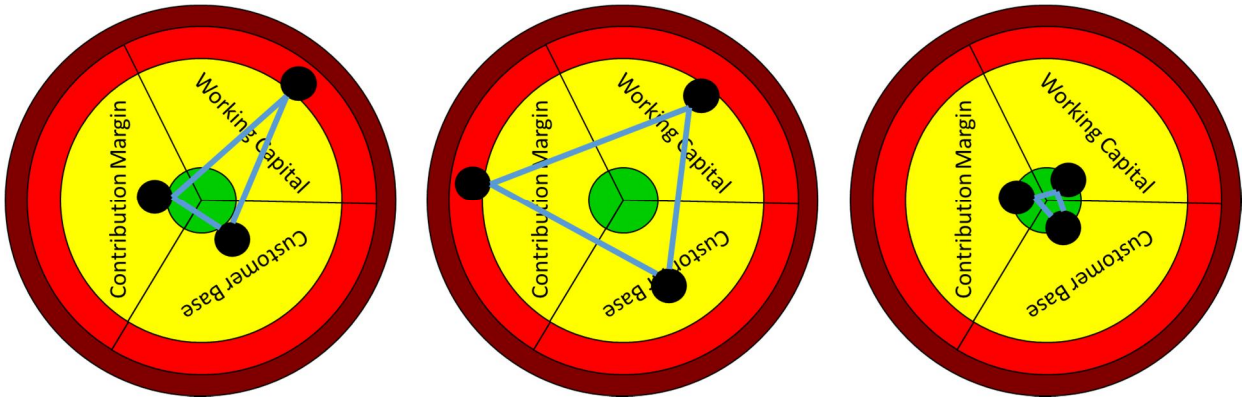
Before we get to specifics about a framework, we should recognize leadership's basic challenge in a complex world. There are three things that management must always be carefully thinking about and managing in order to avoid organizational collapse:

1. The first is working capital which we will define as inventory, cash and credit.
2. Contribution margin is essentially the rate at which the company generates cash. It is selling price minus variable costs.
3. Finally there is something that we will simply call customer base. This is market share, sales volume, service levels and quality – things connected to ensuring and growing a solid base of business for the enterprise.

In this graphic with these three critical considerations we see concentric circles. The outer circles are the biggest area of concern. As we move farther out we get to what can be called the edge of chaos – a real threat to the organization. The very outer ring is collapse – organization fails. Any one of these considerations going past the edge of chaos can cause the organization to fail.



Thus when any one of these considerations moves into that edge of chaos ring, signal strength will intensify, the organization will call, "All hands on deck!" to deal with that specific threat. Of course there is a tension and connection between the three. Organizations must be careful not to over compensate in one area in way or for a duration that might drive another over the edge. Management must constantly fight this battle in our highly complex and volatile environment now and in the future – that is their primary job! Some teams are much better at it than others – especially when they have a framework to tell them what is relevant.



Here are three scenarios. In each case the relative positions of each of the three considerations are plotted. Which scenario is healthier? The first scenario may represent a company that is performing relatively well with regard to contribution margin and the market but is suffering from a working capital crisis. The second scenario depicts a company that is failing to generate cash and is suffering from a working capital crunch. The third scenario is a company that is generating a high amount of cash, has abundant working capital and a well defended and growing base of customers. It should be pointed out

that all three of these scenarios are simply a point in time reference; it could be the same company just at different points in time. The position and tension between our three important considerations is constantly shifting. But how can we hope to manage this highly complex picture in a complex and volatile environment?

Managing this complexity is about striving for something called **coherence**. Coherence is a key term in the emerging science of complex adaptive systems. "A complex adaptive system's "success" depends on coherence of all of its parts. A subsystem's purpose has to be in alignment with the purpose of the greater system in order for there to be coherence. Without that alignment the subsystem acts in a way that endangers the greater system it depends on. Coherence must be at the forefront of determining the signal set, triggers and action priorities. To keep coherent, adaptive agents must ensure both their signal sets contain the relevant information to direct their actions and are not at cross-purposes with the goals of the systems it depends on." (Demand Driven Performance – Using Smart Metric, Smith and Smith, McGraw-Hill, 2013, p. 197)

With our understanding of coherence we need to then examine what the typical risks to coherence are in the modern industrial landscape something often referred to as "The New Normal". A 2016 article in the Harvard Business Review by Martin Reeves, Simon Levin, and Daichi Ueda identified six potential risks to coherence:

1. The COLLAPSE risk – a change from within or outside the industry renders the firm's business model obsolete.
2. The CONTAGION risk – shocks in one part of the business spread rapidly to other parts of the business.
3. The FAT-TAIL risk – rare but large shocks, such as natural disasters, terrorism, and political turmoil.
4. The DISCONTINUITY RISK – the business environment evolves abruptly in ways that are difficult to predict.
5. The OBSOLESCENCE RISK – the enterprise fails to adapt to changing consumer needs, competitive innovations, or altered circumstances.
6. The REJECTION RISK – participants in the business's ecosystem reject the business as a partner.

Yet all of these risks can be managed if a business uses a framework that provides relevant information. But do most businesses even have the basics required for this visibility?

Visibility to relevant information is not just an enabler for flow, it is key for survival. Obscuring, distorting or blocking relevant information risks coherence. Here are some questions you can ask about your organization with regard to visibility and coherence:

- Are people in your organization trained to think systemically? Without the capability to think and problem solve systemically, innovation and adaptation will be severely limited.
- Do they have a common systemic language and framework to think and work within? With different vernacular, nomenclature and modes of operation for similar activity across different areas it becomes difficult for one area to relate to another – there must be constant translation.

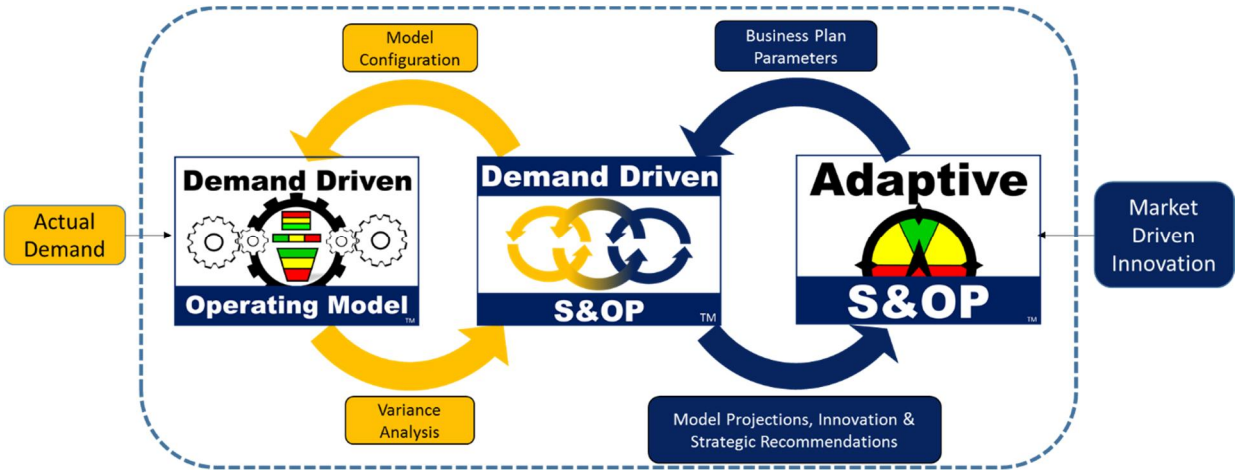
- Do people in your organization understand the connections between departments, resources and people? Without understanding these connections, personnel cannot understand the total picture of flow. They may take actions that seem locally good but is devastating to general flow.
- Are people given enough visibility to understand the connections between departments, resources and people? Without tools and processes to ensure visibility, personnel cannot keep evolving their knowledge of the system.
- Are people discouraged from thinking and offering solutions outside of their operating area? If people are discouraged from thinking globally they will only think locally.
- Do people understand how the different forms of variability effect the enterprise and FLOW through it? Without the ability to understand where to manage variability and what variability to manage people cannot take the necessary steps to protect flow in the system.

How does your organization score with these questions? Creating visibility to relevant information and managing the risks to coherence is no trivial task but it is the only path to sustainable organizational success. The more relevant information our organization has; the more immediate and enduring success it will have – it is that simple.

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 and maintenance of coherence at the enterprise level. They need a blueprint and a step by step path to install appropriate the thoughtware. The Demand Driven Adaptive Enterprise model was designed as a result of this need.

The Demand Driven Adaptive Enterprise (DDAE) Model

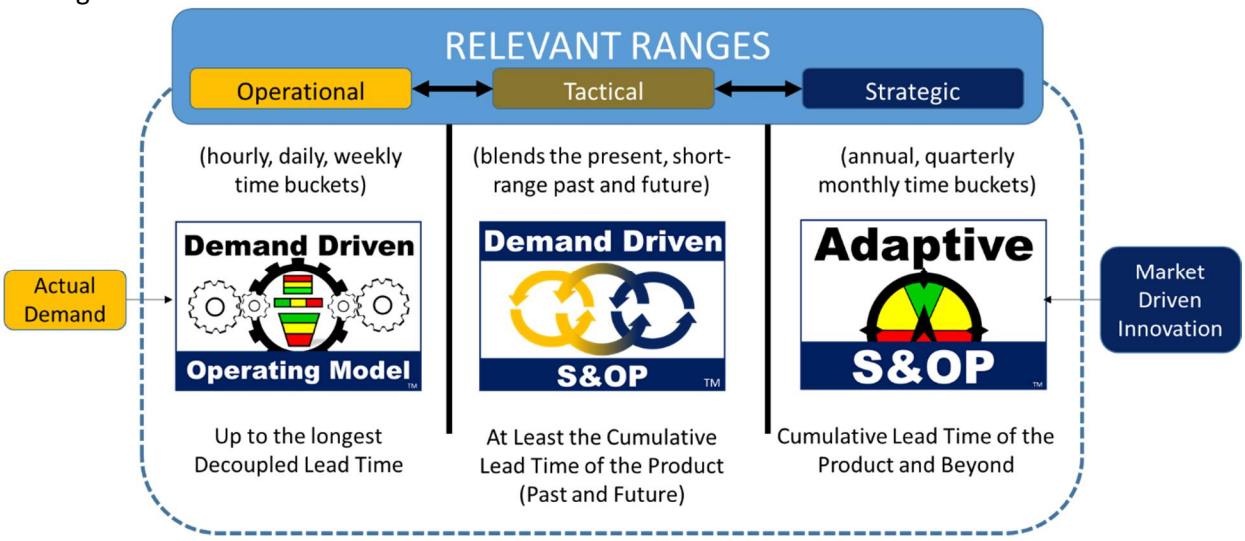
The Demand Driven Adaptive Enterprise model is a management and operational model designed to enable enterprises to adapt to complex and volatile environments. The model utilizes a constant system of innovation and feedback between three primary components; a Demand Driven Operating Model, Demand Driven S&OP and Adaptive S&OP. A Demand Driven Adaptive Enterprise focuses on the protection and promotion of the flow of relevant information and materials across the strategic, tactical and operational relevant ranges in order to drive sustained return on equity performance.



It is neither simply right-to-left nor simply left-to-right in nature. It is both at the same time. It is a bidirectional system that seeks to drive adaptation through a cycle of configuration, feedback and reconciliation through the three components.

The DDAE model incorporates all four of the prerequisites for relevant information discussed earlier in this paper.

Prerequisite #1: Understanding Relevant Ranges.
The DDAE model uses three connected and reconciled relevant ranges; Operational, Tactical and Strategic.



The Operational Relevant Range is typically seen in hourly, daily and weekly buckets but can span up to the longest decoupled lead time of a part/SKU. It is the time range that matters between decoupling point (which defines planning horizons in a Demand Driven Operating Model). Day-to-day operations are managed within the Operational Relevant Range.

The Tactical Relevant Range blends the present with the short-range past and future. It typically spans at least the cumulative lead times for products/SKUs into the past and into the future. Thus, it represents a period (present, future and past) typically at least twice cumulative lead time. The Operational and Strategic Relevant Ranges are reconciled in the Tactical Relevant Range through the DDS&OP process.

The Strategic Relevant Range is typically seen in monthly, quarterly and annual buckets of time. This range typically starts at the cumulative lead times of products and looks further into the future depending on the time required to adapt the model. Business Plan parameters are devised and revised within the Strategic Relevant Range through the Adaptive S&OP process.

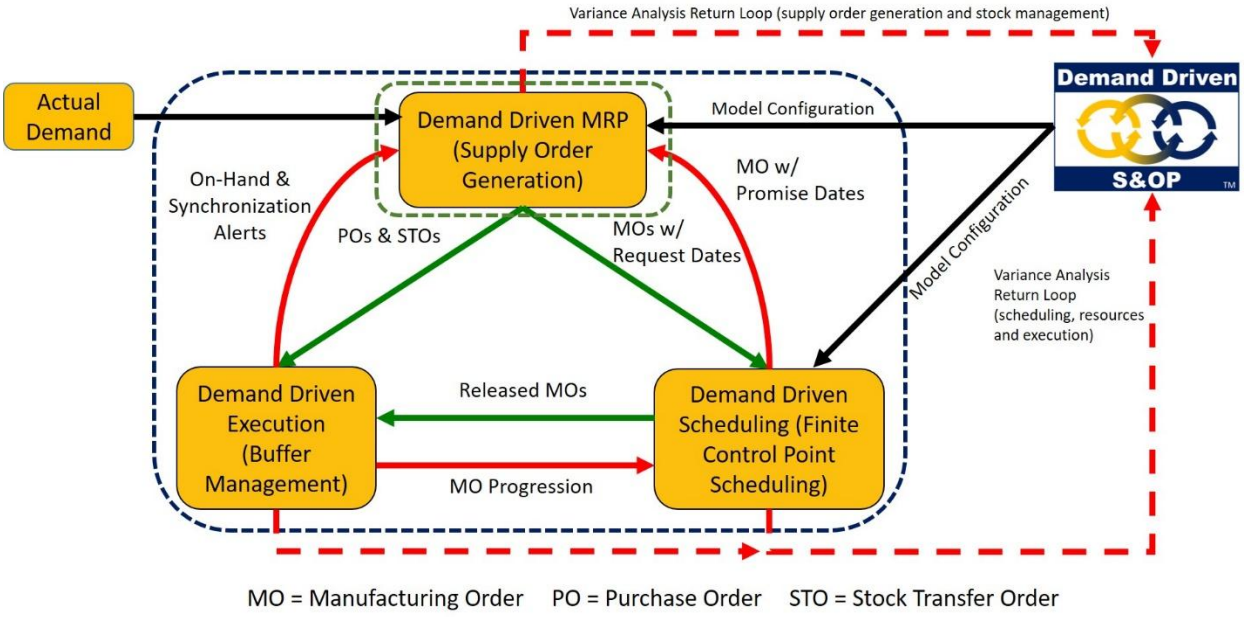
Prerequisite #2: Implement a Flow-Based Operating Model.

The DDAE model incorporates a flow-based operating approach called the Demand Driven Operating Model (DDOM). 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 with 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 operational relevant range. A DDOM's key parameters are set through the Demand Driven Sales & Operations Planning (DDS&OP) process to meet the stated business and market objectives while minimizing working capital and expedite-related expenses.

The DDOM is designed around four basic elements:

1. Pacing to Actual Demand - The Demand Driven Operating Model uses only actual demand for supply order generation. There are no planned orders and no Master Production Schedule used in the DDOM.
2. Strategic Decoupling Points - The Demand Driven Operating Model uses strategically placed decoupling points to compress lead times, shorten planning horizons and dampen demand and supply variability.
3. Strategic Control Points - The Demand Driven Operating Model uses strategically placed control points for scheduling and resource and order synchronization.
4. Dynamic Buffering - The Demand Driven Operating Model protects its decoupling and control points through dynamic stock, time and capacity buffers.

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.



The necessary configurations for DDMRP and Demand Driven Scheduling come from Demand Driven S&OP. In the Demand Driven Operating Model the conventional notion of a Master Production Schedule is replaced with Master Settings managed in the DDS&OP process.

Prerequisite #3: Flow-Based Metrics.

The DDAE model uses different metric emphases within each of the operational, tactical and strategic relevant ranges to promote and protect flow today and into the future. Operational metrics emphasize operations reliability, stability and velocity to determine relevant information and materials in the Operational Relevant Range. Tactical 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 Tactical Relevant Range. Strategic metrics emphasize contribution margin, working capital control and customer base control and development.

	Metric Objectives	The Message Behind the Objective
Operational	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;
Tactical	System Improvement & Waste Reduction (Opportunity $)	Identify and prioritize obstacles/conflicts to flow
	Local Operating Expense Control	Spend minimization to capture the market opportunity
	Strategic Contribution	Maximize system return according to relevant model factors (volume and rate)
Strategic	Contribution Margin (cash generation rate)	Drive innovation (internal and external) and growth to increase cash generation capability (RATE)
	Working Capital (inventory & cash & credit)	Ensure proper levels of working capital to protect and promote flow in the short and long term
	Customer Base (market share, sales & service & quality)	Ensure and grow a solid base of business for the enterprise (VOLUME)

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 messages within their unique Demand Driven Operating Model and market circumstances.

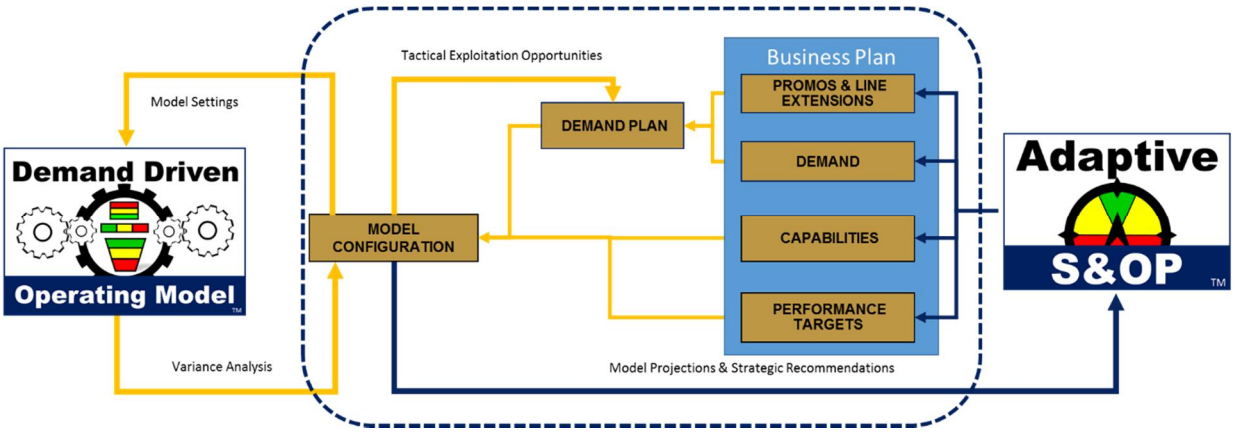
Since all of the metric objectives in each relevant range are designed specifically for flow, the relevant ranges directly connect to each other through the iterative connections between the three components of the DDAE model.

Prerequisite #4: Tactical Reconciliation between Relevant Ranges.
Traditionally there has been a disconnect – a missing link – in the Sales and Operations planning process. S&OP has fundamentally tried to manage the portfolio and new activities, demand and supply while reconciling these with the business plan with a management business review. Successful S&OP implementations have provided a robust process where the management examines marketplace information to pass a doable business plan to operations. However, that connection traditionally has been through a master production schedule – a statement of what can and will be built – that feeds the formal planning system. This has resulted in an organization that cannot easily sense changes in demand and adapt planning and production.

A good S&OP plan is a range – an expected number with a pessimistic lower range and an optimistic upper range. This range represents the intended strategic direction from the executive team. However, traditional formal planning cannot calculate from a range. The MRP system needs a demand plan that is precise in quantity and timing. This is the chasm that must be crossed and traditionally the MPS is used. However, this is like trying to cross the Grand Canyon on a single wire. If you can balance precisely and nobody disrupts that wire, you may get to the other side rather than falling to your death. The volatile uncertain, variable and complex world we must now manage is like someone shaking that wire and having gale force winds coming through the canyon at the same time.

Now with the DDAE Model, the S&OP strategic range can be coupled to the operational capability – no MPS is required. The S&OP plan by family is translated to the required decoupling positions that are necessary to define the operational capability. This is not simply a disaggregation of the product family forecast to the SKU level schedule. The intended strategy with respect to response time, inventory investment, space utilization is reflected in the DDOM design.

A new bridge is required to cross this canyon – that bridge is DDS&OP. Demand Driven Sales and Operations Planning (DDS&OP) is a bi-directional tactical reconciliation hub in a Demand Driven Adaptive Enterprise (DDAE) Model between the strategic and operational relevant ranges of decision making. DDS&OP sets key parameters of a Demand Driven Operating Model (DDOM) based on the strategic information and requirements output of the Adaptive S&OP process. DDS&OP also projects the DDOM performance based on this strategic information and requirements and various DDOM parameter settings. Additionally, DDS&OP uses variance analysis based on past DDOM performance against critical relevant metrics (reliability, stability and velocity) to adapt the key parameters of the DDOM and/or recommend strategic changes to the business.



DDS&OP has five basic elements:

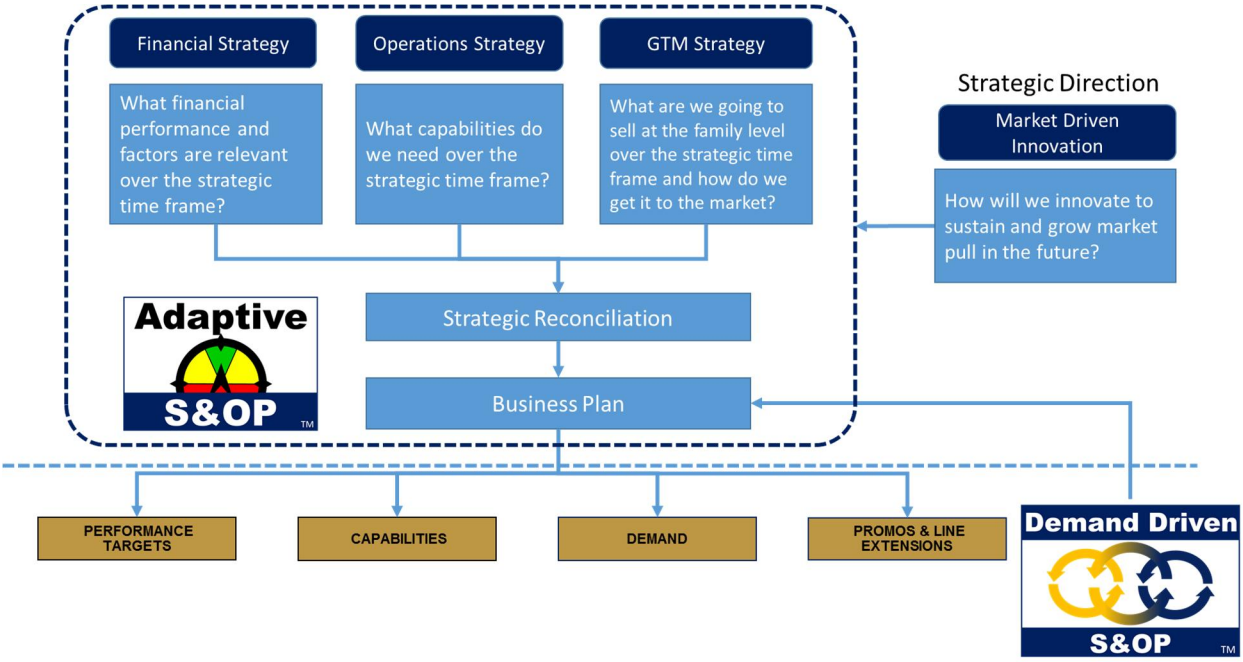
- Tactical Configuration/Reconciliation – shaping the DDOM to match the evolving business plan.
- Tactical Review – variance analyses of reliability, stability and velocity metrics in the DDOM.
- Tactical Exploitation – short range supplements to flow when/if necessary.
- Tactical Projection – projecting model performance under different scenarios for strategic impact, evaluation or development
- Strategic Recommendation – ideas/innovations for better DDOM performance needing senior–level approval.

The most significant impact of DDS&OP is that now S&OP can realize its intended objective – an adaptive process that effectively manages change. In addition, DDS&OP makes the success of the demand driven operating model sustainable. This leaves the final component of the DDAE model to address; Adaptive Sales and Operations Planning (Adaptive S&OP).

Adaptive Sales and Operations Planning is the integrated business process that provides management the ability to strategically define, direct and manage relevant information in the strategic relevant range across the enterprise. Market Driven Innovation is combined with Operations Strategy, Go-to-Market Strategy and Financial Strategy to create strategic information and requirements for tactical reconciliation and strategic projection to effectively create the desired future, drive adaptation and manage change.

Adaptive S&OP starts with asking strategic and critical questions. Market Driven Innovation it is about answering one question – how will we innovate to sustain and grow market pull in the future? Those answers are fed to Adaptive S&OP where three basic questions are answered:

1. What are we going to sell at the family level over the strategic time frame, where are we going to make it and how do we get it to the market?
2. What capabilities do we need over the strategic time frame and how does that compare to our current capabilities?
3. What financial performance and factors are relevant over the strategic time frame? How does this change the overall expected company performance?



The answers to these questions are then reconciled strategically by the senior management team. This team would include representation from the Demand Driven S&OP Integrated reconciliation team to assure alignment across the company. The result of this reconciliation produces a realistic business plan and the defined capability that is sent to the DDS&OP process. Demand Driven S&OP also provides validation and simulation capability for the business plan desired parameters scenarios that may lead to adjustments in the business plan.

The senior management team now has a robust process to develop a doable business plan that is responsive to the market. The These business plan parameters are then sent to the tactical part of the S&OP process, Demand Driven S&OP, for tactical reconciliation. The Demand Driven S&OP process returns signals about the performance of the operating model, validates the business plan parameters and then suggests validation and suggested innovations needing senior level approval. This can be things like new potential markets, new products or additional capital investment requirements.

Together Demand Driven S&OP and Adaptive S&OP create a robust and complete organizational S&OP process that can exploit the capability of the DDOM and ensure the financial success of the enterprise.

The Demand Driven Adaptive Enterprise (DDAE) Development Path

The DDAE model has a defined development path for companies to achieve increasing levels of success through their demand driven transformation. This path has five distinct stages. The entire path is depicted below. Each stage is explained in more detail below.

Stage	1	2	3	4	5
Operating Description	Operational Efficiency (Cost)	Operational Efficiency (Flow)	DDAE I	DDAE II	DDAE III
Operational Objectives	• Cost Reduction • Focus on Response	Flow Protection and Promotion	Fully synchronize and leverage operational capability for better flow performance	Leverage the Demand Driven Operating Model capability across the enterprise and into the market	Sense, Adapt and Innovate across the organization and supply chain (customers and suppliers).
Demand Driven Characteristics	Conventional MPS, MRP, DRP and MES practices. Demand Driven principles are limited to the Incorporation of actual demand into supply order generation. Strategic chronic conflict between cost and service.	Trial and/or expanding implementation of Demand Driven Material Requirements Planning (DDMRP).	Trial and/or expanding implementation of the Demand Driven Operating Model (DDOM) with supporting Tactical Smart Metrics. Beginning to explore DDS&OP process.	A mature DDOM with the strategic and tactical reconciliation process of DDS&OP with Adaptive S&OP in place. A full (strategic and tactical) Smart Metrics suite in place.	A mature DDOM with mature DDS&OP and Adaptive S&OP and Smart Metrics capability. Thoughtware fully installed.
Primary Metrics	• OEE • Fully Absorbed Unit Cost • Service	• Signal Integrity • Decoupling Point Integrity • Average Inventory • Service	• Reliability • Stability • Velocity	• Strategic Contribution • Waste/Improvement • Local Operating Expense Control • RACE/ROIC	• RACE/ROIC Improvement Rate
Analytics	• Absorption Rates • Total Days of Inventory • OTD and/or fill rates	• OTOG % and $ • % to inventory target • OTD and/or fill rates	• Buffer Run Charts • Reason Code Analysis • Flow Exception Reports • Flow Indices	• Outlier Analysis (Time, Capacity and Stock Buffers) Buffer Compression • Throughput Rate and Volume Improvement	• Strategic Conflict Definition and Resolution
Education	Traditional SCM and Financial training and education	Precisely Wrong Workshop, Demand Driven Planner (DDP)	DDP, Demand Driven Leader (DDL), Demand Driven Analyst (DDA)	DDP, DDL, DDA, Adaptive S&OP Workshop	DDP, DDL, DDA, Adaptive S&OP Workshop, Strategic Solutions Program (SSP)
Personnel Capability	Traditional SCM and Financial training and education	Personnel are aware of and capable of describing the problems with conventional planning systems. They are well versed in DDMRP principles and are capable of implementing (at a cursory level) decoupling point buffers.	Personnel understand the broader implications of DDMRP to the organization. Personnel understand how to implement Demand Driven Scheduling and Execution. Personnel are capable of adjusting the DDOM based on performance analytics.	Other functional personnel now understand the requirements and capabilities of the DDOM. Personnel are able to successfully bridge the tactical and strategic relevant ranges. They can project, recommend and adapt.	Strategic personnel are able to analyze complex problem areas (Internal and external), define strategic conflicts and constraints and recommend strategic policy/direction changes. They are able to mentor new key personnel through the DDAS.

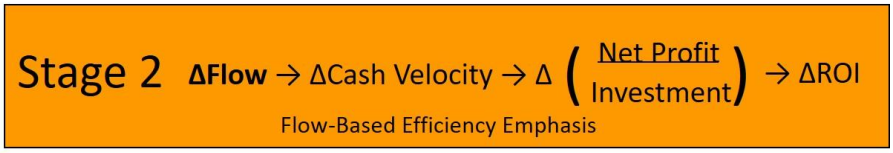
Stage 1: Operational Efficiency (Cost)

The development path starts where most companies find themselves today - locked in a constant struggle trying to drive operational efficiency by controlling or minimizing cost. It's not that flow goes unrecognized in these systems but any flow-based metrics such as on-time delivery constantly struggle against directly competitive cost-based metrics and objectives. This is a recipe for failure in today's hyper-competitive and volatile markets. The characteristics of these companies are listed below.

Operational Objectives	Demand Driven Characteristics	Primary Metrics	Analytics	Personnel Capabilities
Cost Reduction and Responsiveness	Conventional MPS, MRP, DRP and MES practices. Demand Driven principles are limited to the incorporation of actual demand into supply order generation. Strategic conflict between cost and service.	OEE, Fully absorbed unit cost, Service	Absorption rates, Total days of inventory, OTD and/or fill rates	Traditional SCM and Finance training

Stage 2: Operational Efficiency (Flow)

Stage 2 begins a company's transformation into a Demand Driven Adaptive Enterprise. Moving from Stage 1 to Stage 2 takes a dramatic philosophical shift in thinking and understanding about what is truly "efficient" from a system perspective. This shift is not trivial as it requires a fundamental break from the conventional emphasis on cost. The graphic below illustrates this disparity in perceptions. Stage 1 connects ROI improvement to better cost performance while Stage 2 connects ROI improvement to better flow performance. These two views are not compatible with each other – they are, in fact, antithetical to each other.



The initial shift to Stage 2 typically occurs at a relatively local level (plant) and is led by a local champion implementing DDMRP principles in a limited fashion. The results, however, are significant and quickly realized. Planners and buyers, once skeptical of another new "improvement" method quickly take to DDMRP because it is intuitive, appeals to their common sense and promotes better visibility than the conventional approach of MRP with disjointed, disconnected and inconsistent spreadsheets.

Operational Objectives	Demand Driven Characteristics	Primary Metrics	Analytics	Personnel Capabilities
Flow Protection and Promotion	Trial and/or expanding implementation of Demand Driven Material Requirements Planning (DDMRP)	Signal Integrity, Decoupling Point Integrity, Average Inventory, Service	OTOG % and $, % to inventory target, OTD and/or fill rates	Personnel are aware of and capable of describing the problems with conventional planning systems. They are well versed in DDMRP principles and are capable of implementing (at a cursory level) decoupling point buffers

Additionally DDMRP represents the least amount of system "shock" in beginning to prove the beneficial difference of the Stage 2 flow emphasis over the Stage 1 cost emphasis. The benefits come quickly and are tangible in terms of service, working capital and expedite expenses; all of which are easily connected to ROI improvement. This provides the organization with the confidence to proceed further by expanding the DDMRP implementation and eventually moving to the next stage of the DDAE Development Path.

Stage 3: DDAE Level I

Stage 3 is the first level in which an organization can really begin to describe itself as "Demand Driven." Thus the name of the stage is "DDAE Level I". This features a fully implemented Demand Driven Operating Model (DDMRP, Demand Driven Capacity Scheduling and Demand Driven Execution methods in use). The movement from DDAE Stage 2 to DDAE Stage 3 can take years in larger organizations with multiple facilities and vertical integration. This represents an extensive (but hugely beneficial) overhaul of operating tactics impacting supply order generation, resource scheduling, operational execution and metrics. This stage is thoroughly described in *Demand Driven Performance – Using Smart Metrics* (Smith and Smith, McGraw-Hill, 2013). A maturing Stage 3 company will eventually become constrained by a lack of alignment from other functions in the organization.

Operational Objectives	Demand Driven Characteristics	Primary Metrics	Analytics	Personnel Capabilities
Fully synchronize and leverage operational capability for better flow performance	Trial and/or expanding implementation of the Demand Driven Operating Model (DDOM) with supporting Tactical Smart Metrics	Reliability, Stability, Velocity	Buffer run charts, Reason code analysis, Flow exception reports, Flow indices	Personnel understand the broader implications of DDMRP to the organization. Personnel understand how to implement Demand Driven Scheduling and Execution. Personnel are capable of adjusting the DDOM based on performance analytics

Stage 4: DDAE Level II

Stage 4 (DDAE Level II) describes the expansion of the Demand Driven concepts throughout the organization. Tactical reconciliation is in place and the organization as a whole understands how to leverage the mature DDOM capability into the market and throughout the organization for better

financial performance. Its personnel understand and see the company as a system. Finance, Engineering, IT, Marketing, Sales and Strategic Planning understand how to use the DDOM as a competitive weapon and can communicate through a common flow-based language.

Operational Objectives	Demand Driven Characteristics	Primary Metrics	Analytics	Personnel Capabilities
Leverage the Demand Driven Operating Model capability across the enterprise and into the market	A mature DDOM with the strategic and tactical reconciliation process of DDS&OP with Adaptive S&OP in place. A full (strategic and tactical) Smart Metrics suite in place	Strategic contribution, Waste/Improvement, Local operating expense control, RACE/ROIC	Outlier analysis (Time, Capacity and Stock Buffers), Buffer compression, Throughput rate and Volume improvement	Other functional personnel now understand the requirements and capabilities of the DDOM. Personnel are able to successfully bridge the tactical and strategic relevant ranges. They can project, recommend and adapt

Stage 5: DDAE Level III

Stage 5 (DDAE Level III) describes how the organization can become a valuable and strategic supply chain partner facilitating flow with its suppliers and customers in mutually beneficial ways. Its personnel understand and see the supply chain as a complete interconnected network identifying opportunities for better flow creation and protection. Management has the capability to define current and/or impending strategic conflicts and reconcile them through adaptive and innovative solutions. These organizations are capable of mentoring new generations of management through the DDAE model in order to sustain and even accelerate momentum.

Operational Objectives	Demand Driven Characteristics	Primary Metrics	Analytics	Personnel Capabilities
Sense, Adapt and Innovate across the organization and supply chain (customers and suppliers)	A mature DDOM with mature DDS&OP and Adaptive S&OP and Smart Metrics capability. Thoughtware fully installed	RACE/ROIC Improvement Rate	Strategic Conflict Definition and Resolution	Strategic personnel are able to analyze complex problem areas (Internal and external), define strategic conflicts and constraints and recommend strategic policy/direction changes. They are able to mentor new key personnel through the DDAE Model

A complete journey through these five stages can take years. Indeed, the upper stages (4 and 5) may never be achieved as key personnel exit and/or acquisitions occur that slow the momentum or sponsorship of driving the DDAE. At each step the ROI improves and accelerates.

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 resulting in eventual company failure.

The Demand Driven Adaptive Enterprise model 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, tactical and operational levels. Through that visibility, companies can also strip out what is irrelevant, distortive and damaging.

The Demand Driven Adaptive Enterprise (DDAE) Model spans the operational, tactical and strategic ranges of an organization allowing it to continuously and successfully adapt to the complex and volatile market conditions we see today. It combines the fundamental principles of flow management with the emerging new science of complex adaptive systems (CAS). DDAE is the way that successful businesses will work in the 21st Century.

A Special Thanks

The Demand Driven Institute would like to thank Lora Cecere of Supply Chain Insights and Debra Smith of Constraints Management Group for their review and advice in constructing this document and the DDAE Model Development Path.

Educational Offerings Supporting the Demand Driven Adaptive Enterprise Model

Demand Driven Planner

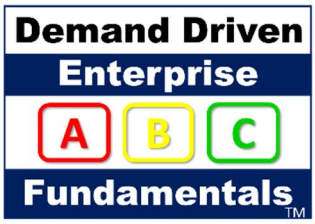
The Demand Driven Planner (DDP) program is designed for planning, purchasing and supply chain personnel responsible for maintaining a DDMRP implementation. Designed by the leading authorities on DDMRP at the Demand Driven Institute, the Demand Driven Planner program is comprised of 13 modules of in-depth DDMRP education. The DDP Program is THE official preparatory course for the ISCEA's Certified Demand Driven Planner (CDDP) Certification test.

Demand Driven Leader

The Demand Driven Leader (DDL) program equips senior and mid-level operations and supply chain managers with the ability to design, implement and sustain a Demand Driven Operating Model including parameter settings through Demand Driven S&OP (DDS&OP). Designed by the leading authorities on Demand Driven methods at the Demand Driven Institute, the Demand Driven Leader program is comprised of 7 modules of in-depth Demand Driven education. The DDL Program is THE official preparatory course for the ISCEA's Certified Demand Driven Leader (CDDL) Certification test.

Demand Driven Enterprise Fundamentals

Learn the fundamentals of the demand driven approach and the components of the DDAE model through a unique and interactive learning experience featuring simulations and case studies.

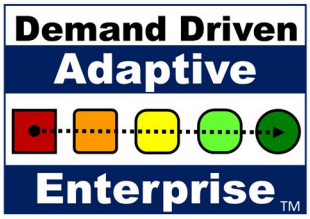


Precisely Wrong Workshop

What if there was one fatal flaw in MRP that makes it completely incapable of conveying relevant information? What if correcting this one fatal flaw allowed the promise of MRP to be attained? This immersive one day workshop will reveal this fatal flaw and trace its impact to everyday situations encountered by planners and buyers. Additionally, an elegant solution to overcome this flaw will be discovered. Participants in this workshop will walk away with a new depth of understanding about conventional planning systems and a list of things they can begin to implement the very next day.

Demand Driven Adaptive Enterprise Introduction

The Demand Driven Adaptive Enterprise (DDAE) Model spans the operational, tactical and strategic ranges of an organization allowing it to continuously and successfully adapt to the complex and volatile supply chains we see today. It combines the fundamental principles of flow management with the emerging new science of complex adaptive systems (CAS). It is the way that successful businesses will work in the 21st Century. This day long workshop will prove a compelling need for change, demonstrate fundamental solution principles and reveal a blueprint to transform the entire enterprise. It is intended for senior management teams.



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