WORKING PAPER

A Data Stack That Compounds

How Layering Your Data Accelerates Growth

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Metrics without a data model are opinions. A data model without metrics is inert. The Data Stack ensures that measurement and structure are always connected, that every metric can be traced to its source, and that governance decisions are grounded in verifiable signal rather than opinions dressed in data.

Thesis: Scaleup stagnation, the inability to accelerate revenue beyond initial traction, is rarely just a failure of product-market fit or competitive positioning. It is often a combination of a fundamental infrastructure failure that leads to other issues. In this case, the impact of a "hollow" data stack stalls growth by severing the connection between what customers are doing and what the board thinks they are doing. Without a complete data architecture, the organization cannot learn from bottom-up signals, leaving top-down resource allocation guided by a "precision illusion" rather than the probabilistic reality of where compounding actually occurs.

Introduction: Every board reviews the same metrics. Growth rate. CAC payback. LTV:CAC ratio. Rule of 40. Magic Number. These are the metrics that drive investment decisions, resource allocation, and company valuations. They are reviewed quarterly, benchmarked annually, and trusted implicitly. But they are computed from something. The question most boards have never asked: what is underneath these metrics, and is it accurate and complete? That question used to be theoretical. AI just made it operational.

Keywords: Data Stack, Hollow Stack, Data Model, Data Schema, Operating Metrics, Performance Metrics, Investor Metrics, Bowtie Model, Loop Gain, Compound Growth Rate, Single-Outcome, Probabilistic Growth, AI Fragmentation, Agent Sprawl, VP of Growth, Compounding Growth Systems, Revenue Architecture

Part I. Data is structured in layers

Business metrics exist in layers. Each layer is computed from the one below it. Layer 0 establishes the measurement points across the complete customer journey. Layer 1 defines the specific metrics captured at each point. Layer 2 uses those metrics to optimize how the business operates. Layer 3 uses operating performance to direct strategic investment. Layer 4 compresses everything into the composite metrics investors use to evaluate the business. Every layer depends on the one below it. Remove a layer, and everything above it loses its foundation.

The stack operates in two directions. Signal flows up from the data model through operating metrics. Guidance flows down from the investor and performance metrics. Signal informs guidance. Guidance directs operations.

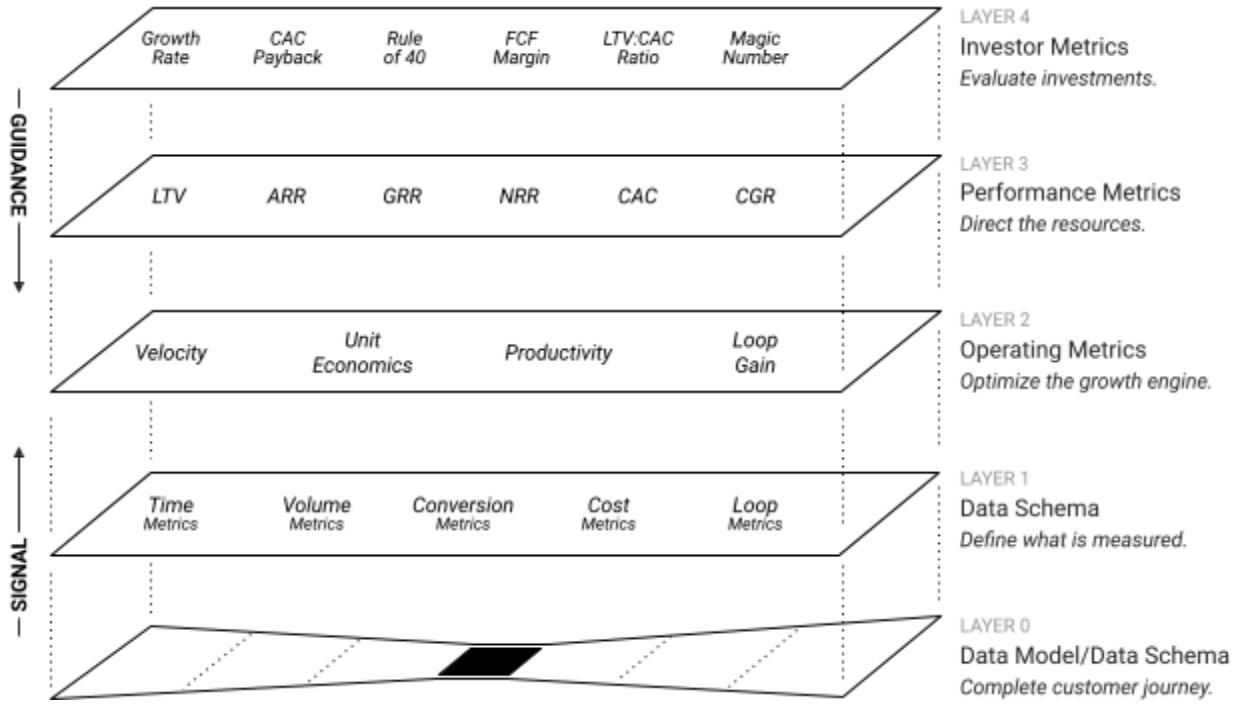

Figure 1: The data stack that compounds

1.1 The Problem of a Hollow Data Stack

Most companies operate from Layer 4. CEOs report on it. Boards review it. Investors screen it. Everyone assumes the layers beneath are in place. They are not. A data stack can be hollow for many reasons — incomplete, disconnected, single-outcome, manual, fragmented, static, or one-directional. This article focuses on the three that matter most in the age of AI.

Problem 1. The Data Stack Is Incomplete

Every company has metrics, data, and measurements. But the layers exist in fragments, built independently, without a shared model or consistent definitions.

Layer 3 is missing. In most recurring-revenue businesses, there is no structured practice that translates performance metrics into resource allocation. No continuous discipline that evaluates a business as an integrated system. CEOs and CFOs read investor metrics and try to run the business based on them. They manage the scoreboard rather than play the game. Most companies have a version of Layer 3, but it lives in a spreadsheet maintained by one person in FP&A. It is not a system. It is not connected to the operating layers beneath it. It is one person's interpretation of the data, updated manually, shared as a static file. When that person leaves, the layer disappears.

Layer 2 is often missing too. Without a performance layer directing them, operators receive targets pushed down from the investor scoreboard. "Reduce CAC." "Improve retention." Raw directives without an operating framework. No growth formula to optimize against. No unit economics model. No productivity framework. Just targets and pressure.

Layer 1 is incomplete. Without a standardized data model underneath, what gets measured is inconsistent. Marketing measures its own funnel. Sales measures its own pipeline. Customer success measures its own health scores. Different definitions. Different stages. Different boundaries. No shared foundation.

Layer 0 was never standardized. Most companies have never adopted a complete model of the customer journey. There is no agreement on the stages, where one ends and the next begins, or where the measurement points should sit. Without this, everything above is improvised.

Problem 2. The Data Stack is Disconnected

The layers that do exist are not connected to each other. Marketing's data does not connect to sales' data. Sales' data does not connect to customer success' data. Each team built its own measurement in isolation. The result is a stack where each layer operates independently, unable to inform or be informed by the layers above and below it.

The industry spent two decades refining Layer 4, inventing increasingly sophisticated composite metrics to evaluate companies from the outside. The layers that produce those metrics were left unconnected. Layer 4 sounds precise. It sounds mathematical. That precision obscures the disconnection beneath it. Most are unaware and continue to operate as if this is not a problem.

It is a huge problem.

Problem 3. The Data Stack is Single-Outcome-based

Every metric at Layer 4 is a single outcome. LTV:CAC is a ratio. The Rule of 40 is a sum. Magic Number is a coefficient. Each presents one outcome, as if the business has one trajectory, one future, one answer. It does not.

Following a growth trajectory is a probabilistic endeavor. Every stage has a range of metrics, not a fixed number that provides certainty. Retention is a probability. Expansion is a probability. The actual outcome of the business is the product of dozens of weighted probabilities across the entire journey.

When the lower layers are incomplete, those probabilities are never modeled. They collapse into point estimates. A single LTV outcome. A single CAC outcome. A single growth rate. The range disappears. The uncertainty disappears. What remains is false precision.

Boards make capital-allocation decisions based on these point estimates. One outcome compared against a benchmark. But a single outcome cannot describe a system with dozens of probabilistic inputs. It describes one scenario. Usually, the one that was modeled to look best. Complete layers preserve the probability distributions. They show the range. They make the uncertainty visible and manageable.

A single-outcome metric is fragile. A probability distribution is resilient. Scaleups fail because they plan for the 50th percentile outcome but lack the data visibility to survive the 20th percentile reality.

Part II. Why This Matters Now

The hollow stack has existed throughout the SaaS evolution. People compensated. It worked because it was a system based on humans operating at human speed. AI operates at a fundamentally different speed, and four forces are now exposing why the hollow stack can no longer sustain it.

2.1 The market has shifted.

Growth is no longer guaranteed by market expansion. The era of growth-at-all-costs is over. The ability to diagnose where growth is stuck and direct resources precisely is the difference between companies that grow and companies that stall. That ability lives in Layers 3 and 4. The layers that most companies were never even aware of existed.

2.2 The operating model has shifted.

Forecasting, pipeline analysis, resource allocation, and customer health scoring are moving to AI-driven systems. This is not a future trend. It is happening. Now. Although the model as a

whole may be governed by people, operations are run by systems operating on data infrastructure.

2.3 Systems require a complete data stack.

People compensate for incomplete data with intuition, experience, and judgment. Systems cannot. AI requires structured data, complete measurement, and consistent definitions across the entire growth journey. But AI doesn't just fail on bad data. It hallucinates a strategy based on it. An AI-driven forecasting tool won't flag the gaps in the stack. It will fill them. It will construct a mathematically coherent, highly confident recommendation built on a foundation that doesn't exist. The output looks rigorous. The math even checks out. Yet, it leads the company off a cliff. A wrong answer you can catch. A hallucinated strategy looks right.

In a hollow stack, AI becomes a force-multiplier for error. It doesn't just make mistakes. It automates them at a scale, and to make matters worse, it operates at a much higher speed. This makes it virtually impossible for a human to audit on time.

2.4 AI fragmentation is compounding the problem daily.

Every team is independently adopting AI, building its own agents. Salespeople create agents for outbound. Marketers build their own agents for each task and campaign. Customer Success builds agents to predict churn and expansion to overcome the shortage. Meanwhile, the entire company celebrates the rapid AI adoption curve, with hundreds of builders, thousands of agents deployed, and dozens of internal tools shipped each week.

We have seen something similar to this before. The SaaS explosion created tool sprawl at the team level. AI agent sprawl follows the same pattern, but at an individual level. A team buying a SaaS tool is a procurement decision. Think of it: when 200 employees are being urged not to fall behind, each building 3 agents using publicly available AI tools, it means 600 disconnected tools are added. No procurement. No review. No one knows they exist until data conflicts surface.

In the past, people could compensate for the hollow stack because it operated at human speed. The velocity of business has now accelerated by a magnitude, making it impossible for humans to keep up. This is a problem that is accelerating toward a disruptive hard reset.

AI only becomes powerful when GTM operates as a system, not as a set of disconnected tools. That system requires a uniform data model that every team, every tool, and every layer of the organization contributes to and operates from. Build that foundation, and every AI initiative compounds on the one before it. That is how growth becomes a system.

Part III. Fix the Stack

Growth at AI speed requires a complete and connected stack. As we just learned, most layers are incomplete and disconnected, causing issues when operating at high velocity. This does not mean you have to start over. It simply means you have to complete each layer and connect them. From the bottom up.

Layer 0: Data Model. Adopt a complete, standardized model for recurring-revenue businesses that covers the entire customer journey from first engagement through expansion and advocacy. The Bowtie replaces the funnel with a unified lifecycle that allows organizations to map and account for the effects of growth loops, not just linear throughput.

Layer 1: Data Structure. Standardize the measurement framework and complete it. Five primitive metric types must be captured against the data model:

- Volume Metrics (counts of leads, opportunities, customers)
- Conversion Metrics (stage-to-stage progression rates)
- Time Metrics (duration and intervals between stages)
- Cost Metrics (spend per activity, stage, and motion)
- Loop Metrics (signal flow across growth loops, are outputs feeding back as inputs?).

Every stage measured the same way, by every team, against the same definitions. Not just conversion rates. The full set of primitives. Make it programmatic, not manual.

Layer 2: Operating Metrics. Optimize around distinct go-to-market motions. Treat each motion as a revenue production line, a system that can be measured, diagnosed, and improved. Four operating metrics are derived from the Layer 1 primitives:

- Productivity (output per rep, per dollar, per motion)
- Velocity (cycle length, time-to-first-value, interval compression)
- Unit Economics (cost to acquire, retain, and expand)
- Loop Gain (the ratio of productive output that feeds back as input per cycle; Loop Gain > 1 = compounding, Loop Gain < 1 = decaying). AI operates here as an execution layer, increasing velocity, efficiency, and accuracy within each motion.

Layer 3: Performance Metrics. Establish probabilistic growth guidance, continuously evaluating the range of outcomes across Layer 2 and directing resources to optimize the path toward the investment thesis. Six performance metrics direct resource allocation:

- ARR (total recurring revenue),

- GRR (gross revenue retention, how much are we keeping),
- NRR (net revenue retention, the combined effect of retention and expansion)
- LTV (lifetime customer value)
- CAC (customer acquisition cost)
- CGR (Compound Growth Rate, the rate at which the system produces growth through internal reinforcement rather than external input). Not quarterly. Not annually. Continuously. Instead of "we target $20M," the conversation becomes "we have 70% confidence of hitting $20M based on current system behavior." AI operates here as a decision layer, replacing point estimates with probability-weighted resource allocation.

Layer 4: Investor Metrics. Operate recurring-revenue businesses to optimize the effects of compounding. Six investor metrics evaluate the growth system as an investment:

- Growth Rate, is the system accelerating, sustaining, or decelerating?
- CAC Payback, how quickly does the acquisition investment provide positive returns?
- LTV:CAC Ratio, is growth efficient? Does the value created justify the cost to create it?
- Rule of 40, is the balance between growth and profitability healthy?
- Magic Number, is incremental sales & marketing spend producing incremental revenue?
- FCF Margin, is the business generating cash from operations?

These are composites; they combine two or more underlying numbers, they are lagging, and they are single-outcome. They matter because investors use them. They are dangerous when treated as the operating system rather than the scoreboard. This means protecting the compound growth engine from short-term decisions that erode it. Annual compensation plans tied to single-year targets are the most common mechanism that cannibalizes long-term compounding. The metrics at this layer must reflect multi-year value creation, not single-period performance.

Today, no one owns the stack. No one designed it. Layers 0 through 2 are maintained by whoever inherited the CRM and the dashboards. Layer 3 may live in an FP&A spreadsheet that few know about. Layer 4 is prepared for quarterly review to go into the board deck, not managed as a system. The stack isn't owned by anyone. Its existence has never even been discussed. It just assembled itself by accident, and no one noticed because we kept running the business against the metrics at the top.

The VP of Growth is expected to fill this gap. Not by reconnecting existing ownership, but by establishing it for the first time. Ensuring signal flows up and guidance flows down. The through-line that keeps the stack complete, connected, and functioning as one system.

Table 1. Self-diagnose your data stack

If you struggle with...	The likely cause is...
Teams define metrics differently	No shared model of the customer journey (L0)
Reports require manual scrubbing before anyone trusts them	Measurement is incomplete, missing time, cost, and closed-loop data (L1)
Pipeline is unpredictable, and forecasts miss	GTM motions are not measured or optimized as systems (L2)
Guessing where to invest limited resources next.	Decisions are made without scenario analysis or probability-weighted options (L3)
Hitting most of the benchmarks, but growth still stalls	Operating on single-outcome metrics that hide the real range of outcomes (L4)

Five Actions for Monday Morning

These are exciting times. Everyone in the organization is experimenting with AI. This is fantastic for people achieving literacy in this new era. Each initiative looks productive in isolation to the benefit of the person. But realize that if they are not connected to the same data stack soon, they will be optimizing against different models, definitions, and assumptions. Ten AI initiatives on ten disconnected datasets are not an AI discipline. It is automated fragmentation at a scale you have not seen before.

The data stack is the infrastructure that gives the entire organization a shared AI discipline. One model. One data structure. One source of truth. Build it in sequence. Each layer is the foundation for the one above it. Now you can judge which AI tools should stay, and which ones should go.

The following 5 simple actions help you achieve that:

Action 1. Adopt the Bowtie as your data model. Standardize where you measure across the complete customer journey. One model, shared across every team. This is the foundation. Nothing above it works without it.

Action 2. Complete your data structure. Define what is measured at every stage. Not just conversion rates. Add time data, cost data, and closed-loop metrics that connect outcomes back to actions. Make it programmatic, not manual.

Action 3. Build operating metrics around each GTM motion. Treat each motion as a revenue production line. Measure unit economics, growth formula, and productivity per motion. This is where AI begins to operate as an execution layer.

Action 4. Establish probabilistic growth guidance. Replace single-outcome targets with probability-weighted resource allocation. Instead of "we target $20M," know your confidence level and what drives it. Staff a VP of Growth to own the connections across the stack.

Action 5. Align investor metrics to compounding. Restructure board reporting and compensation plans to protect long-term compounding. Stop rewarding single-period performance at the expense of the compound growth engine.

This is diligence long overdue. Start at Layer 0. Work up from there. Each layer completed makes the next one possible.

What Happens Next

For the past decade, most SaaS-Natives have been growing at high velocity despite these gaps. We don't have to imagine what happens when these gaps are cleared. AI-Natives built on complete, connected data stacks from day one are now showing growth rates 2-5x faster than their SaaS-Native predecessors.

Imagine what happens when you use your data to your advantage

About the Winning by Design Growth Institute: The Growth Institute is the research and standards body of Winning by Design, focused on the applied study and synthesis of revenue architecture and growth systems. It integrates comparative field diagnostics with foundational systems theory to develop shared frameworks and language for designing, diagnosing, and governing compounding growth systems. Through its Working Paper series, the Institute serves as a think tank for revenue leaders navigating the transition from effort-driven growth to increasingly self-reinforcing systems.