Data Insights on Suppliers as the Ultimate Lever

The Game-Theoretic Framework for Buyer-Led Payment Term Improvement and Working Capital Optimization

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ABSTRACT

A new framework for buyer-led payment term improvement

This paper explores the strategic optimization of Payment Terms with suppliers with a direct effect on Days Payable Outstanding (DPO) from the perspective of a buyer.

By integrating the **Game Theory** concept of **Asymmetric Information** with real-time benchmarking data – specifically through tools like Calculum – we analyze how a buyer can shift the **Nash Equilibrium** to a state that maximizes corporate liquidity without triggering supplier collapse.

I argue that when a buyer possesses superior market intelligence, the "game" moves from a standard **Prisoner's Dilemma** to a **Stackelberg Leader-Follower model**, allowing for the scientific extraction of value.

Calculum Inc., 2026

SECTION 01

The Current Market Situation

An Information Asymmetry

In a standard Game Theory model, players are assumed to have equal standing, and data is the primary currency.

In the Game Theory model, negotiations with suppliers often fail or are sub-optimal because of information asymmetry. Traditionally, the supplier holds the upper hand in information – a phenomenon known as **The Seller's Information Advantage**. In game theory, this makes the supplier the informed player and the buyer the uninformed player.

There are four specific reasons why this imbalance has been the historical norm:

01 **Market Cross-Visibility**

02 **Internal Cost Visibility**

03 **Product-Specific Knowledge Gap**

04 **Tactical Silence**

The following pages detail each of these four reasons.

Four reasons why this information asymmetry has been the historical norm

01

Market Cross-Visibility with Horizontal Intelligence

Suppliers sell to many different buyers, often within the same industry, and obviously, they know when their other customers (buyers) are paying them. In other words, a supplier knows what your competitors are doing. They know that buyer X just accepted 60-day terms, while you are asking for 90.

Because the individual buyer traditionally does not have access to this information, the supplier usually claims that longer terms are not the norm and are never offered to other customers.

02

Internal Cost Visibility

The supplier knows their true Weighted Average Cost of Capital (WACC). In other words, they know exactly how much a 30-day payment increase actually costs them in interest or factoring fees.

Because the buyer doesn't know these internal numbers, the supplier can inflate the perceived pain of longer terms. They can claim that a 90-day term will increase their costs, even if their margins are high enough to absorb it easily.

03

Product-Specific Knowledge Gap

Suppliers understand the operational intricacies of their production cycles better than anyone else. They know exactly when they need cash to pay their own upstream vendors or to purchase raw materials.

Therefore, they can tie payment terms to operational necessity and might say, ***"we need payment in 30 days because our raw material costs are due then."*** Without seeing the supplier's full supply chain, the buyer has to take their word for it.

04

Tactical Silence

In a traditional negotiation, it is the buyer who usually reveals their needs first, such as spend volume, quality, and standard terms. As per Game Theory, the person who speaks first often gives away their Reservation Price (the worst deal they are willing to take).

Suppliers traditionally respond to the buyer's request. By letting the buyer move first, the supplier can anchor the negotiation around their own favorable terms while keeping their actual flexibility a secret.

> *Traditionally, buyers only saw their own data; they had no way of knowing if their requested terms were market standard or aggressive without a tool providing supplier-specific insights on payment terms.*

SECTION 02

The Stackelberg Model of Payment Terms

Rather than a game-theoretic paradox of the **Prisoner's Dilemma**, where two parties (buyer and supplier), acting in their own individual self-interest, end up with a worse collective outcome than if they had cooperated, the real situation is different when looking at negotiation payment terms.

Both parties usually do not default to a defensive, aggressive stance, leading to the **Nash Equilibrium**, a foundational concept in Game Theory, named after the mathematician John Nash.

— KEY CONCEPT

Nash Equilibrium

The Nash Equilibrium describes a state in a game where no player can benefit by changing their strategy unilaterally, assuming the other players keep their strategies unchanged. In simpler terms, it's a point of no regrets. Once you are at a Nash Equilibrium, if you look at what your opponent is doing, you realize that your current move is the best possible response, and vice versa.

A common misconception is that a Nash Equilibrium is the best outcome for everyone. In reality, it is often suboptimal. In payment terms negotiations, as discussed earlier, information asymmetry usually hides the true Nash Equilibrium. When you reveal the truth (Symmetry), the equilibrium often shifts toward the party with the better data.

Especially in modern global procurement, dealing with multinational buying organizations, companies often operate within an **Oligopsony** with a few dominant buyers having leverage over many sellers; the game-theoretic landscape shifts because the power balance is fundamentally skewed.

Even more important, when a buyer has access to specialized supplier intelligence, the information asymmetry – traditionally held by suppliers regarding their own bottom-line acceptance rates – is neutralized. This allows the buyer to optimize terms that are mathematically calibrated to the limit of a supplier's **Reservation Term** (or the liquidity floor), functioning exactly like a Reservation Price.

— KEY CONCEPT

Reservation Term

While a Reservation Price is the lowest amount of money a seller will take for a product, the Reservation Term is the longest period of time a supplier can wait for payment before the deal becomes a net loss.

This situation, where one party has access to intelligence, can also be described by the **Stackelberg Model**. It is a power-based model used by dominant buyers in an Oligopsony to dictate terms based on data rather than on compromise.

— KEY CONCEPT

Stackelberg Model

The Stackelberg Model is a strategic framework from game theory that describes a market where there is a leader (who moves first) and a follower (who moves second). In this model, the leader gains a "first-mover advantage" by anticipating the follower's inevitable response and setting a production or pricing strategy that maximizes their own profit. This forces the follower to optimize their own position based on the leader's already-established market presence, creating a clear hierarchy in the competitive landscape.

In a standard Nash negotiation, both parties are guessing each other's moves simultaneously. In a Stackelberg Model, the sequence is the strategy: The buyer, in this example, moves first by setting a firm, data-backed requirement such as *"our global standard is 90 days"*. The buyer does this knowing exactly how the supplier will react. The supplier observes the buyer's move and chooses their best response, with their options usually restricted to: accept the terms, request a price swap, or exit the relationship.

However, the Stackelberg buyer is only successful if it has perfect information. If the buyer sets a term that is physically impossible for the supplier, the buyer fails.

As a result, having access to insights on payment terms and data on individual suppliers provides the buying organization with the following benefit:

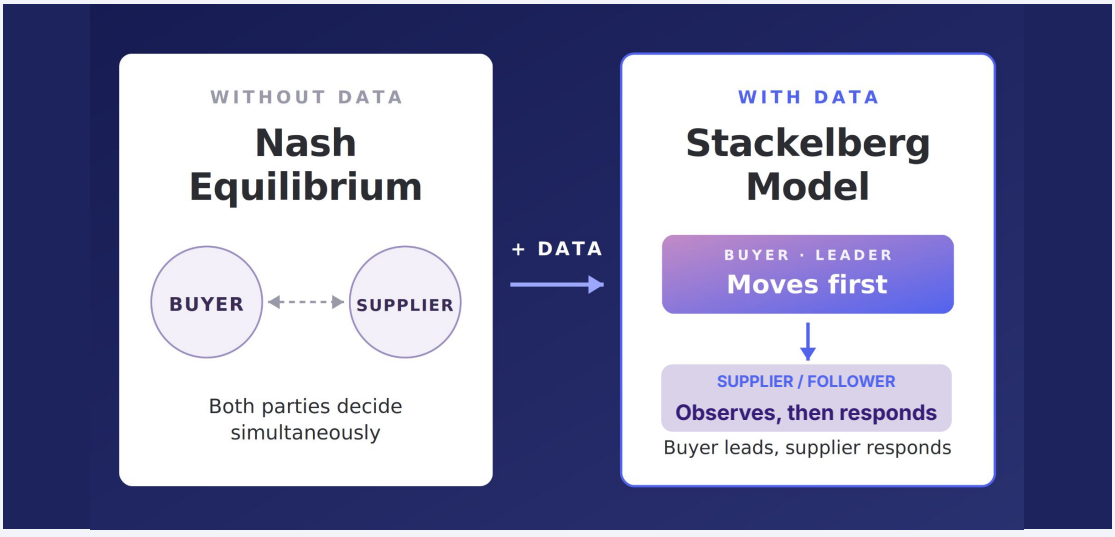
The Buyer–Supplier Move Sequence

B **The Buyer's Move:** Utilizing Calculum's data-driven insights, the buyer identifies the optimal payment term a specific Supplier or Supplier Peer-Group has accepted elsewhere in the market (e.g., 90 days).

S **The Supplier's Response:** The supplier faces the following choices:

1. Accept the new payment terms that are fully aligned with the market and retain the contract
2. Reject the new terms and either lose a critical revenue stream or have the sales revenue reduced,
3. Agree to an equivalent price reduction as the buyer is acting as a funder paying its supplier earlier than its peers.

If the buyer knows these variables based on market benchmarks, they can set terms at the exact point where the supplier is indifferent, thereby capturing the maximum possible float.



SECTION 03

Eliminating the Information Gap
through Market Intelligence

In traditional game theory, incomplete information allows a player to misrepresent their internal state. Suppliers often use a **Distress Signal** by claiming that longer terms will lead to higher costs on their side or that nobody else is receiving such payment terms – a tactic known in game theory as a tactical bluff.

As Procurement Category Manager, having real-time insights transforms the negotiation into a game of **Perfect Information**.

B **Benchmarking:**

Proof that the supplier (or their direct competitors) is already accepting other terms (e.g. 90 days) with other customers. This transforms the discussion from a multi-round stochastic game into a single-round negotiation where the buyer knows exactly how much surplus can be extracted before the supplier reaches their breaking point (the point where the marginal cost of financing the receivable exceeds the net profit margin of the contract).

F **Financial Health Scoring:**

Real-time visibility into the supplier's financial strength, credit rating, cost of debt, and Weighted Average Cost of Capital (WACC). For example, if the data shows a supplier has a high cash-on-hand ratio, their threat of high impact on their financial health is mathematically invalidated.

$ **Financing Solutions:**

If financing solutions are available, such as Supply Chain Finance, procurement can use them to invite the supplier to its finance program. But when doing so, it is key to understand if the financing is beneficial for the supplier and if the supplier is already participating in other programs.

In a normal negotiation, there is too much noise (uncertainty and misinformation) for a buyer to be effective and successful with its negotiation.

If the buyer isn't sure if the supplier is lying, they hesitate and fear that by being too strict, they might accidentally hurt a critical supplier or lose a high-quality partner.

The result, which can be observed over and over again in the market: The buyer backs down, and the negotiation settles at a sub-optimal 45 or 60 days, instead of 90 days.

Detailed data insights on the supplier and its terms act as a **Noise-Canceling Filter**. When the buyer has access to peer-group benchmarks and financial health scores, the data shows that the suppliers and three of the vendor's direct competitors are already operating on 90-day terms; the supplier's claim of impossibility is then revealed as noise.

Overcoming the Price-Term Parity

Suppliers often retaliate against long terms by applying the **Price-Term Parity**.

— KEY CONCEPT

Price-Term Parity

In the world of Game Theory, Price-Term Parity is the supplier's primary defensive maneuver against a buyer. When a buyer ask for longer payment terms, the supplier responds by baking the cost of money into the unit price to protect their net margin. This essentially turns the payment term into a hidden interest rate.

To counter this, leading buying organizations utilize **Decoupled Negotiations**:

- **Phase 1 (Price):** Lock in the unit price based on market benchmarks.
- **Phase 2 (Terms):** Once the price is fixed, use data insight on terms (such as the data provided by Calculum) to adjust the payment terms.

By separating these two rounds, the buyer prevents the supplier from using price as a defensive punishment for the defection on terms. The supplier is in a subgame perfect equilibrium where they have already committed to the price and cannot easily walk away from the deal when terms are extended.

The "De Facto Bank" Effect and Free Rider Problem

The "De Facto Bank" effect is commonly referred to as **Trade Credit Redistribution** in corporate finance. Recent research indicates that suppliers often function as financial intermediaries for their customer base. When you, as a buyer, pay early, you aren't just settling an invoice; you are providing an unsecured, low-interest capital injection to your supplier.

Because capital is fungible, the supplier does not isolate your funds. Instead, they use your liquidity to bridge the financing gap for other clients – often your direct competitors – who have higher negotiating leverage or weaker balance sheets. Essentially, the buyer's liquidity becomes the collateral that allows its competitor to demand longer payment terms.

By paying early, the buyer is not only financing the supplier's balance sheet and liquidity but more importantly, it is also funding the supplier's ability to say ***"yes"*** to the buyer's competitor's long payment terms demands. In essence, a supplier can only agree to a competitor's request for extended terms if they have the cash flow to survive the wait. As a result, the buyer is acting as bank, and its capital is effectively subsidizing their growth and market flexibility.

Harvard Business School (HBS) research on **Supply Chain Contagion** suggests that being an "early payer" in a vacuum creates a Free Rider problem.

The supplier uses the buyer's "interest-free loan" to mitigate the risk and cost of the competitor's late payments. Scientifically, the buyer is yielding the WACC (Weighted Average Cost of Capital) spread to the supplier, who then passes that financial advantage onto other customers with longer payment terms to maintain the relationship.

Therefore, as a buyer, it is crucial to understand where you stand with your payment terms with your suppliers – are you aligned with your peers, or are you paying earlier? If the latter is the case, you should negotiate a discount based on your WACC or align your payment terms with your competitors purchasing from the same supplier. The key to determining your position is having insights into the payment terms with every single supplier and having the data on your peers.

SECTION 04

The Shadow of the Future as a Lever

While the Game Theory analysis suggested that niceness builds trust, leading buying organizations use the **Shadow of the Future** differently. As such, procurement offers the supplier a long-term cooperation (future contracts) in exchange for the adjustment of payment terms, aligned to the market benchmark.

— KEY CONCEPT

Shadow of the Future

The Shadow of the Future is a central concept in Game Theory, popularized by Robert Axelrod.
In the context of payment terms, it refers to the impact that the prospect of future interactions has on current behavior.

The model behind the Shadow of the Future is the idea that we behave better today because we know we have to deal with the same person tomorrow.

The buyer may use the Shadow of the Future as a lever. They might say ***"we are asking for 90-day terms, but in exchange, we are looking to sign a 2-year framework agreement."*** Because the supplier values the future stream of certain revenue more than the present cost of a terms increase (e.g., +30 days), the buyer can successfully trade future stability for present-day liquidity.

Managing the Risk of Zero-Sum Failure

Buyers must ensure they do not push the supplier into a **Zero-Sum Failure**. This concept moves the buyer from a one-size-fits-all policy to a surgical procurement strategy.

— KEY CONCEPT

Zero-Sum Game

In a Zero-Sum Game, one party's gain is exactly equal to another's loss. If a buyer extracts $1M in liquidity by extending terms, but that extension costs the supplier $1.1M in high-interest factoring fees, the game has created negative value.

In Game Theory, this is the transition from a broad, blunt move to a perfect information strategy, where the buyer avoids the winner's curse – winning the negotiation on terms but losing in the long-term by increasing the risk of supply chain disruptions, where the supplier may stop maintaining equipment, cut quality control, or de-prioritize the buyer's orders in favor of faster-paying customers.

In the context of payment terms, Price (Term) Discrimination is a sophisticated application of Market Segmentation. In standard economics, **Price Discrimination** occurs when a seller charges different prices to different customers for the same product (like airline seats).

— KEY CONCEPT

Term Discrimination

In procurement, Term Discrimination is the inverse of Price Discrimination: the buyer applies different payment terms for similar contract values. Instead of applying, for example, a 90-day term to everyone, the buyer uses data to customize terms based on each supplier's specific profile, including industry, country, financials, etc.

Advanced buyers use data insights on their suppliers to move away from standard terms and toward segmented terms. This prevents the Zero-Sum Failure while maximizing total liquidity. Therefore, it is crucial to understand the financial strength and the cost of debt of each supplier when optimizing payment terms.

In game theory, the power of the buyer is only as strong as their BATNA (Best Alternative To a Negotiated Agreement). Understanding their alternative suppliers is a risk-mitigation move:

For example, if the buyer has five other suppliers who can provide the same part, their leverage is high. On the other side, if there is no alternative, the buyer is in a cooperative game. In this case, pushing for aggressive terms is a high-risk move because the buyer has nowhere to go if the supplier fails.

Supply Chain Finance (SCF) is a great tool for turning many payment terms extensions into a Positive-Sum Game.

— KEY CONCEPT

Supply Chain Finance

Supply Chain Finance allows the buyer to extend terms while ensuring the supplier gets paid early. SCF uses the buyer's credit rating (usually a lower cost of capital) to provide liquidity to the supplier via a third-party funder, usually a bank. This creates a win-win solution because both parties' balance sheets are optimized simultaneously.

The Strategic Importance of Preparation – Winning Before You Walk In

According to the principles of the **Harvard Negotiation Project**, the outcome of a negotiation is often decided long before the parties sit down. In the context of payment terms, preparation is not merely about having a target date (e.g., Net 60); it is about eliminating **Information Asymmetry** and neutralizing the cognitive biases that lead to deadlock.

The following three pillars outline why rigorous preparation is the most critical component of negotiations.

01 Advanced Intelligence.

HBS research emphasizes that high-performing negotiators investigate the supplier's financial health as deeply as their own. Effective preparation requires data mining the supplier's cost of capital and their working capital metrics.

Preparation means defining your Best Alternative to a Negotiated Agreement (BATNA). Without a data-backed alternative (such as a verified quote from a competitor offering Net 60), you lack the leverage to walk away.

Scientific Benchmarking: By accessing industry standards, benchmarks on the supplier and what they are offering to other clients you ensure your opening anchor is aggressive yet credible, preventing insulting offers that shut down collaborative dialogue.

02 Strategic Simulation.

The simulation effect is a primary tool taught at HBS to combat the **Fixed-Pie Bias** – the common mistake of assuming that every day you gain in payment terms is a direct, unmitigable loss for the supplier.

Therefore, it is important to pre-empting potential pushback and simulating a "No" (e.g., "Our margins are too thin for early payment discounts") that allows you to prepare a strategic alternative or the Zone of Possible Agreement (ZOPA).

03 Identifying the Decision-Maker.

Usually, S=sales representatives have no authority to alter payment terms. As such it is important to understand beforehand who can negotiate and agree on the new payment terms to avoid wasting valuable trade-offs on individuals who lack the power to say "yes."

SECTION 05

Data
as the Ultimate Lever

Data is the ultimate weapon in modern procurement; it transforms negotiation from a subjective debate into an objective reality. In this buyer-centric model, the competitive advantage is no longer just size – it is the analytical precision based on benchmark data for each individual supplier and real-time market signals. By using **Calculum** to identify exactly where a supplier and its competitors have set the market floor on payment terms, the buyer eliminates the risk of the unknown and replaces intuition with evidence. The result is a mathematically optimized treasury that treats the supply chain not just as a source of goods, but as a strategic reservoir of interest-free capital.

By maintaining a strong leader stance in this **Stackelberg Negotiation**, the buyer ensures that their liquidity is maximized, their cost of capital is lowered, and their suppliers remain compliant through the sheer force of market transparency. The Stackelberg Model is a strategic framework from game theory that describes a market where there is a leader (who moves first) and a follower (who moves second). In this model, the leader gains a "first-mover" advantage by anticipating the follower's inevitable response and setting a strategy that maximizes their own profit. This forces the follower to optimize their own position based on the leader's already-established market presence, effectively dictating the terms of engagement.

When a buyer possesses this competitive advantage and access to real-time market data, the negotiation of payment terms is no longer a collaborative "nice" game; it becomes a disciplined exercise in **Value Extraction**. By using Calculum to bridge the information gap, procurement can confidently move the equilibrium to a state of high DPO, ensuring that their liquidity is maximized while keeping the payment terms with the supplier aligned to other key market players.

Ultimately, information is the only currency that never loses value; the party with the most accurate data doesn't just win the negotiation - they define the rules by which it is played.

WORKING CAPITAL INTELLIGENCE

About Calculum

Calculum is a Data-as-a-Service (DaaS) company that helps organizations benchmark themselves against peers, analyze supplier performance, optimize spending, and negotiate better terms.

Leveraging machine learning and predictive analytics, Calculum's mission is to revolutionize payment term negotiation, supplier risk assessment, working capital optimization, and Supply Chain Finance.

Headquartered in Miami, the company empowers procurement teams to unlock free cash flow, mitigate supply chain disruptions for corporations, and strengthen relationships with trading partners.

Our Data empowering your Organization

USD 3.3 trillion
Global Spend Volume Analyzed

7.5 million
Suppliers analyzed in 90 Industries

8-11% Working Capital
Opportunity for every dollar spent analyzed

WORKING CAPITAL INTELLIGENCE

How can Calculum help procurement shift the negotiation game

Over the past few years, **Calculum** has worked closely with several industry-leading companies, helping them with their focused approach to cash leadership.

Leveraging AI and data analytics, Calculum's Ada platform helps clients ensure the maximization of shareholder value and gain competitive advantage by optimizing and negotiating better payment terms with their suppliers.

The **Ada Platform** identifies and improves 8–12% in working capital for every dollar spend analyzed.

Contact us

We are ready to provide you with insights on payment terms that will help improve your working capital structure and performance.

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Ready to bring data-driven precision to your payment term negotiations?

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