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Friends-of-the-Firm Mini-Briefing

AI Won't Save Your Supply Chain from Bad Data

Before You Fund Another AI Initiative, Ask Whether Your ERP System Is Feeding it Verifiable Facts or Hallucinated Fiction

by

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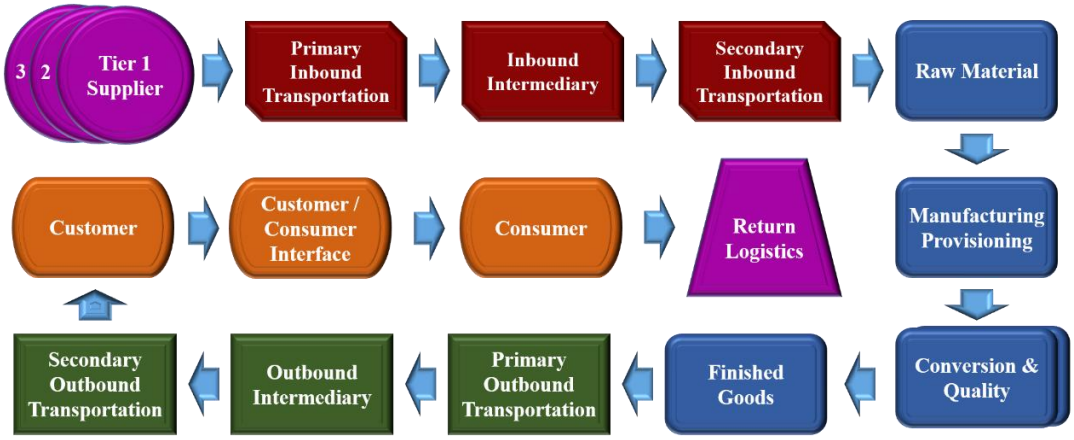
Abstract

The effectiveness of artificial intelligence (AI) and large language models (LLM) in supply chain management (SCM) is fundamentally constrained by the quality of the raw data upon which it depends. This briefing examines the role of data quality in enterprise resource planning (ERP) systems, and downstream functional planning systems, including:

- Material Requirements Planning (MRP)
- Advanced Planning Systems (APS)
- Capacity Requirements Planning (CRP)
- Demand Driven Material Requirements Planning (DDMRP)
- Sales & Operations Planning (S&OP)
- Warehouse Management Systems (WMS)
- Transport Management Systems (TMS)
- Cost Management Systems (CMS)

This briefing also examines AI and LLM tools in the broader global 15-element End-to-End ERP ecosystem (referred to as E^3RP) and depicted in the following illustration:

Scope of End-to End Global Supply Chain Management - 15 Elements



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Drawing from documented research evidence and observational insights from our firm's supply chain practice, this briefing demonstrates that poor data quality - specifically in master data and system parameter elements, including demand forecasts, lead times, lot sizes, safety stocks, operational standards, capacity constraints, reorder points and unit cost parameters - leads to systemic planning errors, degraded decision making, and amplified risk when combined with AI tools. This briefing also identifies critical questions supply chain professionals should address regarding data integrity and highlights systemic risks, including fragmented data architectures and overreliance on unverified AI outputs.

AI Begins With Data

There is a dangerous fantasy loose in supply chain management. It says that once a company adds enough AI to its planning stack, the old messes will begin to disappear. Forecasts will improve. Inventory will stabilize. S&OP will become genuinely strategic. Buyers, planners, schedulers, master schedulers, order fulfillers, dispatchers, expediters, and cost accountants will stop living in triage mode. The *"machine"* we are told, will finally transform chaos into order.

That story is appealing. It is also backwards, if not outright wrong:

> *Artificial intelligence does not begin with intelligence. It begins with data.*

In real supply chains, the raw data that matters most still lives in unglamorous places: ERP item masters, bills of material, routings, inventory status files, supplier records, lead time values, lot sizes, reorder points, safety stocks, forecast tables, operational standard files, work center master files, standard costs, and system-generated action logic. Thus:

> *If any of these raw data inputs are incomplete, stale, inconsistent, badly governed, or quietly wrong, AI does not rescue the enterprise from error. It industrializes and amplifies the error.*

In Gartner's 2023 report, "*How Will LLMs Impact Data Quality Initiatives,"* the authors illuminated ways that poor data quality costs organizations at least $12.9 million a year on average and adds that 59% of organizations do not measure data quality at all. The same Gartner research identifies inconsistency across sources as the most challenging data-quality problem, and argues that centralized, widely shared datasets, such as master data, deserve the broadest governance focus because of their wide business impact.

That problem gets uglier once AI enters the picture. In *"A Compounding Threat: The True Cost of Poor Data Quality,"* published by IBM in early 2026, Tom Krantz and Alexandra Jonker report that a 2025 IBM Institute for Business Value survey found 43% of COOs identify data quality issues as their most significant planning priority. The same IBM article states that more than 25% of organizations estimate they lose more than $5.0 million annually due to poor data quality. The survey goes as far as suggesting that supply chain leaders should *"tattoo"* these facts onto every capex AI planning proposal. Stated clearer:

> *AI systems inherit and amplify data quality issues when the data is inconsistent, incomplete, biased, or outdated. This in turn disproportionately increases errors and decreases the quality of resulting decisions.*

AI-Dependent Data Elements In Supply Chain Management

Anyone who understands how supply chain planning actually works should find this obvious. Columbia University's published planning class instructor notes, *"Material Requirements Planning (MRP),"* described it better than most, reminding us that MRP is a computer-based production planning and inventory control system whose three major inputs are the **master production schedule**, the **product structure records**, and the **inventory status records**. The notes are explicit: without these basic inputs, MRP systems cannot function. The notes further detail what those inputs must contain:

- Forecasts and firm customer orders in the master production schedule
- Part numbers, quantities, and lead times in the product structure
- Accurate on-hand inventory and scheduled receipts in the inventory status records

If these elements are not maintained accurately, record integrity dramatically diminishes. Strip away the marketing language, and the truth is brutal: planning quality is still chained to the quality of schedules, structures, and records. Take aware inventory and interoperation buffers (think JIT), and the planning systems simultaneously delay and accelerate errors in replenishment decisions. JIT you see, still relies on accuracy of planning data elements… just faster.

That is exactly the case I made in my Friends-of-the-Firm Briefing, *"Never Trust Your ERP System! How to Achieve & Maintain Information Systems Master Data & Operating Parameters Integrity."* I argued that integrated systems often fail not because the software itself is to blame, but because companies were never serious enough about the quality of the data going into the system in the first place. I was extremely specific about the types of data that do the damage: missing or inaccurate lead times, lot sizes, safety stocks, purchase prices, and other master-file elements that drive planning and reporting. I also made a harder point that many executives still resist:

> *Bad data is not self-purging. Once it enters the decision system, it creates more bad data and increases the probability, and often the magnitude, of future bad decisions.*

As an analog to understanding how AI depends on quality input data, let's examine a just few critical issues with bad data in ERP and broader systems E^3RP ecosystems:

- **Lead time** is a perfect example because it is both ordinary and lethal. In my prior briefing, I proposed that when lead times are missing, the algorithm-driven scheduling system assumes instantaneous supply. The result is not abstract. It is operational chaos - shortages of required parts, early arrivals of the wrong supporting materials, higher inventory, lower factory utilization, and rising cost pressures are the normal result of such chaos. Columbia University's MRP notes complement this with formal planning logic - lead times are used to time-phase planned order releases - and poorly training MRP operators often cope with uncertainty by inflating lead times, inducing dangerous safety-time use, and expediting purchasing AND internal supply orders… all resulting in continuously shifting operations priorities. Put these views together and the conclusion is inescapable:

  > *If the lead-time element in and ERP system is fiction, the resulting schedules are no more than fiction with dates attached.*

- **Safety stock** is no safer when the data behind it is stale. On this point, I argued that when safety stock data element in ERP is missing or inaccurate, the business runs out of material before replenishment can

occur, dragging the company into the same sort of shortage-and-expedite spiral created by bad lead times. Celonis, an AI-focused software provider, published a piece in its 2022 article *"Master Data Improvement: Keep Your Planning Parameters Up To Date Against Today's Supply Chain and Demand Volatility,"* says that supplier lead times, safety stock levels, and reorder points are crucial to ensuring the right material is available at the right time while minimizing excess inventory. That article adds that shifts in both replenishment and consumption patterns have made it *"incredibly challenging and crucially important"* to keep those planning parameters up to date. The source is vendor-backed, yes, but the point is operationally sound:

> *Safety stock is not a ceremonial data element. It is a live policy decision encoded in the ERP through intelligently determined policy parameters.*

- **Lot size** belongs in the same conversation, although it rarely gets executive attention until it starts distorting economics. I previously wrote that missing lot-size information causes ERP to allocate purchasing and setup costs incorrectly and distorts the total product cost picture. Columbia University's MRP notes add needed context by describing several lot-sizing rules… lot-for-lot, fixed order quantity, fixed order period, Wagner-Whitin, Silver-Meal, and part-period balancing - each of which implies a different tradeoff among setup cost, holding cost, and responsiveness. Once again, the lesson is not exotic:

> *Lot size is another intelligently determined planning policy parameter. If it is wrong, stale, or absent, the system may continue planning, but it is planning with damaged economics.*

Now layer modern advanced planning software on top of this foundation. Microsoft Learn's article *"Action Messages - Supply Chain Management – Dynamics 365"* defines an ERP system action message as a system-generated recommendation to change an existing planned, approved, or firmed order when requirements change. The system can recommend that an order be advanced, postponed, increased, or decreased. It can also propagate derived actions through BOM relationships. That sounds sophisticated because it is sophisticated, but…

> *Sophistication is not the same thing as truth.*

If the underlying lead times, order multiples, safety stocks, dates, or lower-level component relationships are wrong, the system-generated recommendation can be perfectly logical and still economically or operationally wrong. It is not hallucinating. It is obeying the fiction it was handed.

Data Dangers In Supply Chain Management Organizations Using AI Tools

This is precisely where AI becomes more dangerous than merely flawed. In my previous Friends-of-the-Firm Briefing, *"Artificial Intelligence Dangers in Supply Chain Management: What Will You Do When Your Supply Chain Professionals 'Outsource' Their Curiosity & Imagination to AI?",* I argued that AI becomes especially hazardous when users lacking underlying supply chain logic, stop questioning the output and surrender their ability to perform basic quality assurance on the tool's recommendations. My tome may have been provocative, but my central warning is reinforced by plenty of published literature. In the 2025 peer-reviewed review article *"Intelligent Supply Chain Management: A Systematic Literature Review on Artificial Intelligence Contributions,"* António R. Teixeira, José Vasconcelos Ferreira, and Ana Luísa Ramos reviewed 66 studies and found meaningful AI applications in supplier selection, inventory management, demand forecasting, logistics planning, and resilience. Their article identifies persistent barriers - especially data governance, ethical

concerns, and scalability - and calls for stronger transparency and hybrid Human-to-AI collaborations. That is not a vote for blind automation. It is a warning label written in academic language.

The same friction appears in Sales & Operations Planning. In Helmi Aro's 2025 University of Vaasa thesis *"Improvement of Demand Planning in Support of S&OP Process,"* Helmi describes demand planning as a critical process for managing the supply chain by forecasting demand and balancing supply with demand. Her thesis emphasizes that effective S&OP depends on strong demand planning and identifies data accuracy, active knowledge sharing, and organization-wide collaboration as essential factors. She also reports that the organizations studied had room for improvement in data accuracy, tool flexibility, and visibility of supplier capacity. That matters because it drags the discussion back down from glossy AI narratives to operational reality:

> *Even where the process is formally strategic, the weak link is still often the accuracy and usability of the underlying data.*

Proving this data integrity point further in another recent GDI Friends-of-the-Firm Mini-Briefing, "*Systems Engineering in Supply Chains,"* I added a concern about systems-level diagnoses that many companies still avoid because it sounds too expensive to confront honestly… that fragmented data is the hidden killer of planning systems. In that briefing, I wrote that too often planning signals live in one system, execution data in another, and context elsewhere, which forces supply chain teams to spend more time validating information than acting on it. Gartner made the same point more politely when it described inconsistencies across sources and lack of ownership as major obstacles to data-quality improvement. What I call fragmentation, Gartner calls inconsistency and weak ownership. The management failure is the same. The enterprise lacks a governed and dependable system-of-record for planning critical truth.

That is why the most dangerous errors in supply chain management don't develop from faulty AI models. It is the bad ERP parameters the model quietly accepts as truth that creates the real danger:

- The lead time nobody owns
- The safety stock nobody validated
- The lot-size field nobody reviewed after the business changed
- The inventory record contaminated by poor transaction discipline
- The forecast history polluted by exceptions and overrides
- The action message that looks *"smart"* only because the system never admits that its assumptions are stale

> *ERP enhanced with AI tools is no different than giving a 16-year-old boy who lacks appropriate judgement skills, the keys to a Ferrari F50. You know the inevitable outcome!*

The BIG Question To Ask Before Deploying AI Tools in Supply Chain Management

And this brings us to the question executives and Boards of Directors should be asking before they approve the next AI planning initiative and supporting capex investment:

> *What exactly is the machine learning from?*

Think for a minute here:

- If lead times are wrong, what is it learning?
- If safety stock reflects old policy or planner folklore instead of measured uncertainty, what is it optimizing?
- If BOMs and routings lag reality, what is it exploding and scheduling?
- If forecast history is contaminated, what is it projecting forward?

If the organization cannot tell you who *"owns"* and is accountable for the quality of those data elements, how often they are reviewed, how accuracy is measured, and what business process breaks when they drift, then the company is not AI-ready in any serious operational sense.

The blunt conclusion is this:

> *AI will not save a supply chain from dirty ERP data. It will not launder stale parameters into judgment. It will not turn fragmented data architecture into a qualified system-of-record. It will not make bad assumptions less dangerous just because data is processed faster. What it will do and do very efficiently… is increase the speed, scale, and confidence with which those bad assumptions move through the enterprise… unknown until they cause a supply chain crisis.*

IBM says AI systems inherit and amplify poor data quality. Gartner says poor data quality is costly, undermeasured, and too often orphaned. Columbia University says planning logic cannot function without valid core inputs. And I have said the same thing from the factory floor up through the executive office:

> *If the data going in is wrong, the output coming out cannot be trusted.*

An Idea Worth Exploring: Applying SPC to Data Integrity in ERP & Supply Chains

As organizations expand ERP systems into E^{3}RP ecosystems by embedding AI-driven tools throughout the supply chain, the importance of controlling data quality at its source becomes extremely critical. Traditional data governance methods - validation rules, approvals, and periodic audits - are no longer sufficient in AI-supported environments where data moves rapidly across interconnected systems and feeds automated decision-making engines. Perhaps it's appropriate to borrow a technique from our quality management friends?

Statistical Process Control (SPC), widely used to manage production quality at the operator level, could breathe life into AI-centric ERP systems and E^{3}RP ecosystems by offering a structured, proactive approach to managing data complexities by treating data integrity as a measurable and controllable process… just like production processes.

In most ERP environments, master data and system parameters are often treated as static assets subject to quality checks at discrete points - typically during data entry or review. However, data is continuously created, modified, and consumed across the global supply chain. Each of these activities is part of an ongoing process that can exhibit variation:

> *SPC applied to data integrity introduces a fundamental shift in perspective. Instead of inspecting data after it is created, organizations monitor the process that produces the data. By applying statistical sampling and analytic techniques, SPC applied in this manner enables teams to evaluate whether data creation and maintenance processes are stable, predictable, and capable of meeting defined*

quality standards required by downstream decision support systems… like ERP and E³RP.

This process-oriented approach is essential in modern globalized supply chains, where data issues are rarely isolated events and are more often symptoms of systemic instability. One of the most powerful advantages of SPC is its ability to detect deviations in process behaviors early. Through continuous monitoring, SPC identifies trends and anomalies before they result in widespread defects:

Important questions are effectively made inescapable.

In an ERP systems context, this may include:

- Gradual increases in incomplete supplier master records
- Unexpected shifts in product classification accuracy
- Unexplained reversals in inventory on-hand balances after year-end adjustments
- Unavailable explanations in general journal transactions
- Spikes in data corrections following system or process changes
- Unexplained trends in shipment returns

Without SPC, these issues may remain hidden until they disrupt downstream processes or degrade AI model performance. With SPC applied to master file data elements and system parameters, deviations trigger timely investigation and corrective action, preventing small issues from becoming large systemic problems.

Variation is inherent in any process, including data creation and management. However, excessive, or uncontrolled variation leads to inconsistencies that compromise system reliability. SPC can provide the tools, including control charts, to distinguish between normal variation and abnormal, or *"special cause"* variation that requires attention.

In supply chain data-centric processes, controlling variation is critical because:

- Demand management models depend on consistent historical intrinsic data and validated extrinsic market pattern data
- Optimization tools require reliable input parameters
- Flow determinations depend upon accurate status updates
- Automated workflows rely on standardized data structures

By stabilizing data processes, SPC ensures that ERP systems and broader E³RP ecosystems (and supporting AI tools) operate on consistent and predictable inputs, improving their effectiveness and reducing the risk of error propagation:

SPC in data management shifts data governance from a rule-based discipline to a data-driven one.

Instead of relying on subjective assessments or sporadic audits, organizations use real time acquired statistical evidence to identify which data-driven processes are out of control and require intervention. This allows data governance teams to:

- Prioritize high-impact data issues based on measurable variation
- Validate the effectiveness of corrective actions over time

- Establish objective performance baselines for data quality

SPC's emphasis on evidence-based decision-making aligns with the broader goals of digital transformation, where transparency and accountability are essential. Modern E^{3}RP ecosystems are also designed to evolve, integrating new data sources, partners, and AI capabilities where and when necessary. In such dynamic and broad environments, maintaining data integrity is not a one-time effort but an ongoing process of refinement. Further, SPC supports continuous improvement by providing a feedback loop that:

1. Measures process performance
2. Identifies variations and instabilities
3. Implements corrective actions
4. Monitors results over time
5. Repeats

This cycle enables organizations to systematically improve data quality processes, ensuring that enhancements to ERP and AI systems are supported by equally robust improvements in underlying data integrity.

AI tools in supply chain management rely heavily on the quality of data input. When data integrity is compromised, AI outputs - no matter how advanced the algorithms - become unreliable. SPC can help safeguard against this risk by ensuring that the data feeding these systems is stable, consistent, and trustworthy. In E^{3}RP ecosystems, where data flows across internal *and* external systems, maintaining this trust is especially important:

> *Weak data integrity can lead to false signals, missed anomalies, or incorrect recommendations, undermining the very purpose of AI-driven decision-making.*

By applying SPC, organizations create a foundation of reliable data that supports confident, data-driven decisions across the supply chain. Applying SPC to data integrity in E^{3}RP ecosystems and adjacent systems, transforms data management from a reactive activity into a proactive discipline. By treating data processes as measurable systems, organizations can detect issues early, control variation, and continuously improve performance.

In the context of E^{3}RP ecosystems and AI-enabled supply chains, this approach no longer feels optional - it now appears to be essential:

> *SPC applied to data and system parameters, ensures that the raw data underpinning these advanced systems remains accurate, stable, and trustworthy; enabling manufacturing, distribution, and logistics organizations to fully realize the benefits of their increasingly expensive digital transformation efforts.*

Conclusion

So, before you fund another expensive AI initiative, audit the data that already runs your global supply chain. Not because that work is glamorous, but because it is necessary. In metaphoric terms, it is the math behind the robot's physical motions. Supply chain management organizations that win from AI will not be the ones most impressed by their digital tools. They will be the ones disciplined enough to ask ugly and unromantic questions first:

- Is the lead time real?
- Is the inventory record trustworthy?

- Is safety stock based on measured variability or institutional superstition?
- Are the Bills of Material and Bills of Operations accurate?
- When were lot sizes and operation standards last reviewed and updated?
- Are the sales order placement, completion, distribution and delivery dates and times accurate?
- Are customer master data elements, including pricing and discount terms, accurate?
- Do we know who owns the data element, who reviews it, how often it is validated, and what happens to the business when it is wrong?

These questions and comparable questions about every algorithm-centric parameter utilized in every corner of every modern E^3RP ecosystem will not make the keynote stage at any tech conference. But they are the questions that separate actual digital supply chain management capability from expensive and delusional theater.

About Alan G. Dunn

Alan G. Dunn is currently President of GDI Consulting & Training Company and founder of the Manufacturing Executive Institute (MEI). He is also the creator and lead-instructor of the 18-month **Next Generation Global Supply Chain Leadership Development Program** at the California Institute of Technology's (Caltech) Center for Technology & Management Education (CTME), where he has taught since 1984. Mr. Dunn also serves on the University of California at Riverside's (UCR) Advisory Board for Transformative Leadership in Disruptive Times.

Previously, Mr. Dunn was a Vice President at Gemini Management Consulting (now Capgemini) and a Partner at Coopers & Lybrand (now PwC). In both positions, he led large technical manufacturing teams through innovative productivity enhancement projects. Mr. Dunn has participated in >190 significant manufacturing and distribution projects inside >120 companies. He has worked in 24 countries on 6 continents, and across most manufacturing sectors. Mr. Dunn has delivered >850 discrete training sessions over his career.

Mr. Dunn specializes in supply chain management, strategic planning, manufacturing management, operations management, leadership development, cost management, and business finance. He is curious and passionate about everything in the manufacturing and distribution industries. This curiosity and passion have led him to lead 6 significant supply chain research projects, author >70 published articles, create >15 significant consulting methodologies and develop >100 training courses for professionals in the manufacturing & distribution industries. It is Alan's deep depth and breadth in the global supply chain body-of-knowledge that provides him with an ability to assemble and lead highly capable teams to solve problems thought to be unsolvable.

Over his 46-year career in global supply chain consulting, Mr. Dunn has served on the Boards of Directors of numerous public, private and non-profit companies. He is the recipient of the National Association of Corporate Directors (NACD) prestigious *"Director of the Year"* award in 2007.

Alan is a career-long volunteer for the Association of Supply Chain Management (ASCM), having served as the President of the Orange County Chapter in 1984 and Chairman of ASCM in 2015. He was inducted into the *"ASCM New England Supply Chain Conference Hall of Fame"* in 2022. Mr. Dunn has spoken to nearly all the APICS/ASCM chapters and at the ASCM international Conference >20 times.

Mr. Dunn has a degree in business management from California State University, Fullerton, where he occasionally lectures in the business school.

About GDI Consulting & Training Company

GDI Consulting & Training (GDI) provides practical solutions to complex business and managerial problems in manufacturing and related industries. Our firm has successfully assisted clients around the world for more than 40 years, having performed more than 190 projects in over 120 companies in 24 countries. GDI applies specialized and common-sense solutions... *not overly intellectualized approaches...* too numerous types of challenging client problems in manufacturing and distribution industries, including:

Complex Problem Solving	Core Business Process Re-Engineering
Factory & Distribution Facilities Layout & Design	Enterprise Performance Metrics & Compensation Systems
Cost Management Systems	Organization Design & Improvement
Operational Due Diligence	Business Strategy Formulation
Quality Management Systems Design & Implementations	IT Data Integrity & Reliability Improvements
Factory & Distribution IT Systems Design & Implementation	Process Flow Design & Implementation

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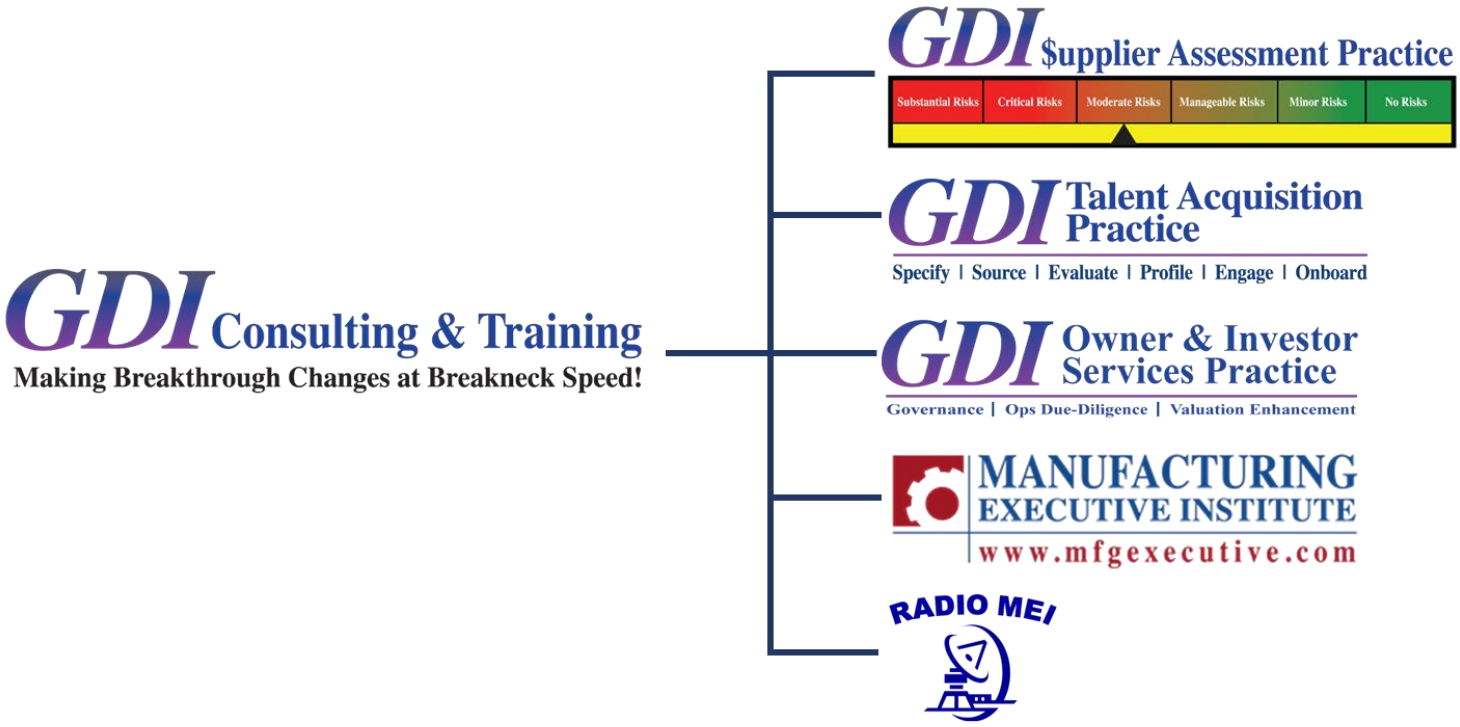

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