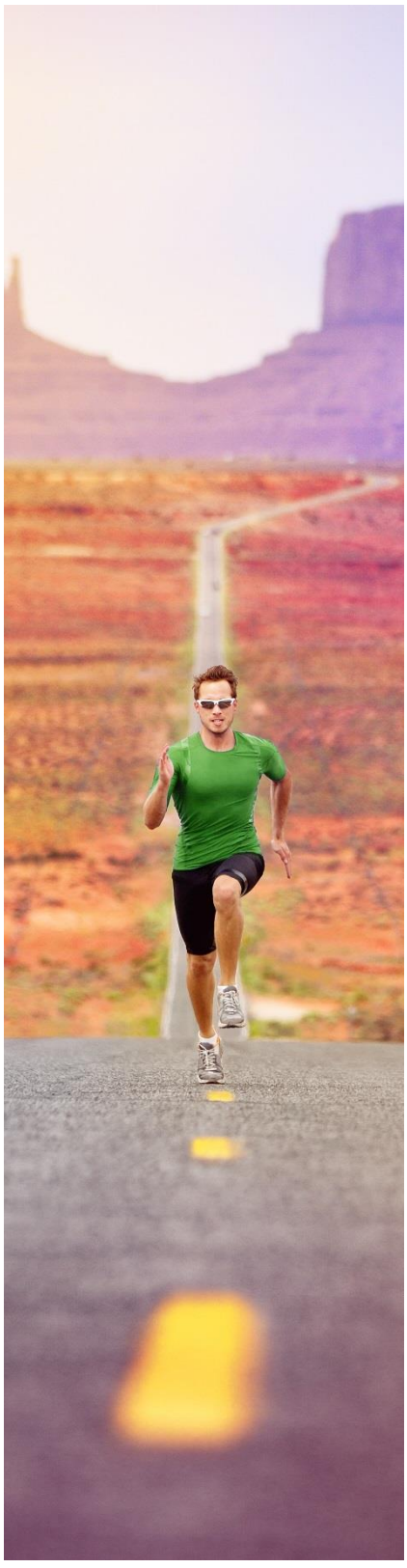

Agile Integration:

Accelerating Time-to-Value in Supply Chain Implementations

No matter how powerful the algorithms and intelligence are in a supply chain planning and optimization system, the results can only be as good as the data fed into those engines. The vast majority of the data consumed by these systems resides outside that specific system; mostly in the firm's ERP systems, but also in various other execution systems such as WMS, TMS, procurement systems, as well as other supply chain planning systems (large companies often have more than one supply chain planning system, for different purposes, divisions, or regions). Increasingly, that data is coming as well from Internet-of-Things (IoT) and sources outside of the enterprise, such as weather, traffic, market data, trading partners' systems, social media, and other information. Thus, having agile, rapid-implementation integration tools is critical to taking advantage of rich, diverse sources of data in order to unlock and realize the full potential of supply chain planning and optimization systems.

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Agile Integration: Key to Unlocking the Power of Supply Chain Systems

Single ERP Vendor Approach Does Not Solve Supply Chain Integration

Companies that have committed to a strategy of using a single ERP vendor's suite for all their applications—including using the ERP vendor's supply chain planning and optimization modules—often do so on the hope that they will get deep, out-of-the-box integration between all of those components. They believe or hope that the ERP vendor's supply chain planning module is tightly pre-integrated with the core ERP system, including all the relevant master data, and the other components from the ERP vendor, such as WMS, TMS, and procurement. Unfortunately, that is often not the case. Such a level of pre-integration often doesn't exist and/or the company is running multiple ERP instances, often with customizations per instance.

Lack of Pre-built ERP-Supply Chain Integration; Different Architectures and Platforms

In too many cases, an ERP vendor's supply chain suite was developed completely independently and on a different architecture[1] than their core ERP system. With two development groups operating independently, the integration between the two systems is in many cases incomplete, requiring a lot of additional effort (and consultants) to make it all work.[2]

Multiple ERP Instances

In the 1980s and '90s, a big part of ERP's appeal was the promise that one system could 'do it all.' That myth has since been largely busted; the vast majority of large enterprises have many different ERP systems,[3] scores of best-of-breed systems, and hundreds of minor systems. The multiplicity of systems is driven by different business units' desires for independence and systems that meet their specific needs, as well as a steady flow of mergers and acquisitions bringing in new business units that already have different systems.

Faster, Easier Integration Tips the Scales to Best-of-Breed Solutions

It has become steadily less costly to integrate best-of-breed systems. In the '80s and '90s, data was generally passed between systems using either 'swivel chair integration'[4] or hand-crafted integration code, making for very expensive and brittle integrations. Integration platforms have come a *really* long way since then, steadily lowering the barrier to a multiple best-of-breed suite strategy.

Not All Best of Breed Integration is Equal

However, not all best-of-breed vendors have the same level of integration capabilities. This is critical when assessing a solution provider, because rapid integration capabilities are a foundation for business agility. Too many best-of-breed providers still use outdated integration approaches, with lots of project-specific work

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[1] Sometimes a different architecture was selected for a good reason, for example to provide an in-memory architecture to enable more rapid supply chain planning and optimization. That decision may have been necessary because the original core ERP was not built on an in-memory architecture.

[2] Some ERP vendors are making big investments to move their different systems onto common platforms going forward, but in many cases, they still have a long way to go. In any case, if you are still using their legacy ERP platform, their new platform may not be of much help in getting your supply chain solution up and running now.

[3] Even when a company has standardized on SAP or Oracle or another platform, they often have many instances of that ERP system (up to 30 or more for a large corporation).

[4] '*Swivel-chair integration'* refers to having an employee read information from one screen and then swivel to another screen to key it into the other system. In practice, they were often reading it from a printout. In the '90s, enterprise application integration platforms were nonexistent or in their early infancy.

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required, resulting in complex, lengthy, risky, and costly integration projects. In contrast, some best-of-breed solution providers have become 'best-of-integration providers' as well, bringing together a set of purpose-built technologies, templates, and methodologies that dramatically shrink complexity, cost, duration, and the amount of in-house resources required for integration projects.

Agility and speed in integration of best-of-breed systems is highly valuable in keeping a business competitive over time; whether it involves integrating a new business from M&A activities, or quickly adopting new systems to gain new competitive capabilities, or upgrading existing systems regularly without disruption[5] to keep up with the latest and greatest technologies. Thus '*time-to-integration*' should be a key criterion when selecting a supply chain solution provider. Each month shaved off of implementation is one month more of value and competitive advantage realized from the system.

Making Mega-Mergers Work

A good example of how a supply chain solution provider can help with integration is Logility's role in the merger of two very large F500 companies. They have taken on the responsibility of integrating supply chain planning and optimization into the ERP and other systems of the newly combined entity and doing it in a timely manner. This allows the line of business people to focus on the *business* integration and doing revenue-producing work to sustain them through the multi-year process of integrating the two firms. It also frees up internal IT resources to focus on more fundamental architectural and policy integration, instead of spending their time on supply chain application integration.

Challenges for Supply Chain Integration

Integration, Still the Long Pole in Supply Chain System Implementations

Despite the tremendous progress in integration tools, integrating data across multiple systems is still a difficult job and is often the critical path of an implementation project. *Anything that shrinks time-to-integrate is likely to shrink overall project duration and time-to-value proportionately.* That is part of why rapid integration is so valuable. Here are some of the challenges that need to be overcome to realize rapid integration:

- *Lack of internal resources*—Integration projects often relying on internal resources (IT and end user), which are in short supply, thus extending the project. Anything that can lighten the internal project team's load can help shorten implementation times.
- *ERP's supply chain modules not pre-integrated*—As mentioned, even the ERP vendor's own supply chain module often requires a tremendous amount of work to integrate.
- *Multiple ERP systems or instances*—The integration challenge is compounded when there are many ERP instances and/or a mix of ERP solutions from different vendors. When different instances have been customized, then usually each integration needs to be customized too.
- *Inadequate testing*—Cutting corners on testing to meet deadlines can potentially create disastrous false starts, turning what could have been a killer, winning project into a pariah that no one wants to be associated with.
- *Poor sustainability/adaptability*—Integration is not a 'one and done' effort. It must be made

[5] This requires a *sustainable approach* to integration, i.e. one that provides rapid integration of new systems and simplified accommodation of changes to any of the systems already integrated.

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sustainable as the systems and data around it continually evolve over time. If it requires a significant new integration project to adapt each time changes are needed, then those integrations are delayed and the supply chain system starts losing value and usefulness, sometimes quickly and dramatically. When the solution integration was done largely using internal resources, with a custom design, it is far too common that the solution integration becomes unsupportable once the key resources leave or change jobs. As the integration becomes unsupportable, it will often take the entire solution down with it.

Global Enterprises' Integration Challenges

Global businesses face several additional challenges when it comes to integration of their supply chain systems:

- *Short or non-existent daily time window for moving data*—Depending on the approach taken, the integration system may need to wait until all data across the globe has been finalized for the day. That can create a very narrow window of time to extract the data for a firm with global operations.
- *Huge data volumes*—Supply chain planning and optimization can involve huge amounts of source data. For example, for store/SKU inventory levels, a chain with 3,000 stores and 25,000 SKUs per store will have 75 million store/SKU inventory records to be updated daily. The inclusion of IoT data makes this data explosion even bigger, as enterprises track potentially billions of individual events (over time) across the enterprise.
- *Lack of data quality and completeness*—Poor quality or incomplete data leads to poor quality outputs and thereby lack of confidence in the answers the planning systems are giving. Optimization engines are only as good as the data they receive. Once experienced people start seeing bad answers, they no longer trust the results, leading to resistance, rebellion, and workarounds, which prevents the value of the investment from being realized. Cleaning up existing data sources is usually the biggest part of an integration project. And for sustainability, the system needs the ability to continually validate that clean, complete, properly formed, within-range data is flowing into the supply chain systems, so that any problems are detected and corrected early. Ideally, this validation is done at the source, so that bad data is corrected before even entering the source system. Nevertheless, a second line of validation defense should be done as the supply chain system ingests the data.
- *Incomplete supply chain model/representation*—While validation of individual data elements is a challenge, it is often even harder to validate that the supply chain model described by the sum of the individual data elements is meaningful. If a supply chain contains products that go through ten different stages, but there is no linkage in the systems between, say, stage six and stage seven, then it will be impossible for an optimization engine to generate a meaningful solution. A purpose-built integration solution must include technology that allows those types of conditions—the gaps and inconsistencies in the end-to-end supply chain model[6]—to be identified and resolved.

Figure 1 illustrates these challenges and the timeframes associated with a typical approach to integration, contrasted with the accelerated timeframe that is possible with an agile approach.

[6] The end-to-end model of the supply chain is embodied by the data representing all the various process steps, across all the various systems involved in executing an end-to-end supply chain process.

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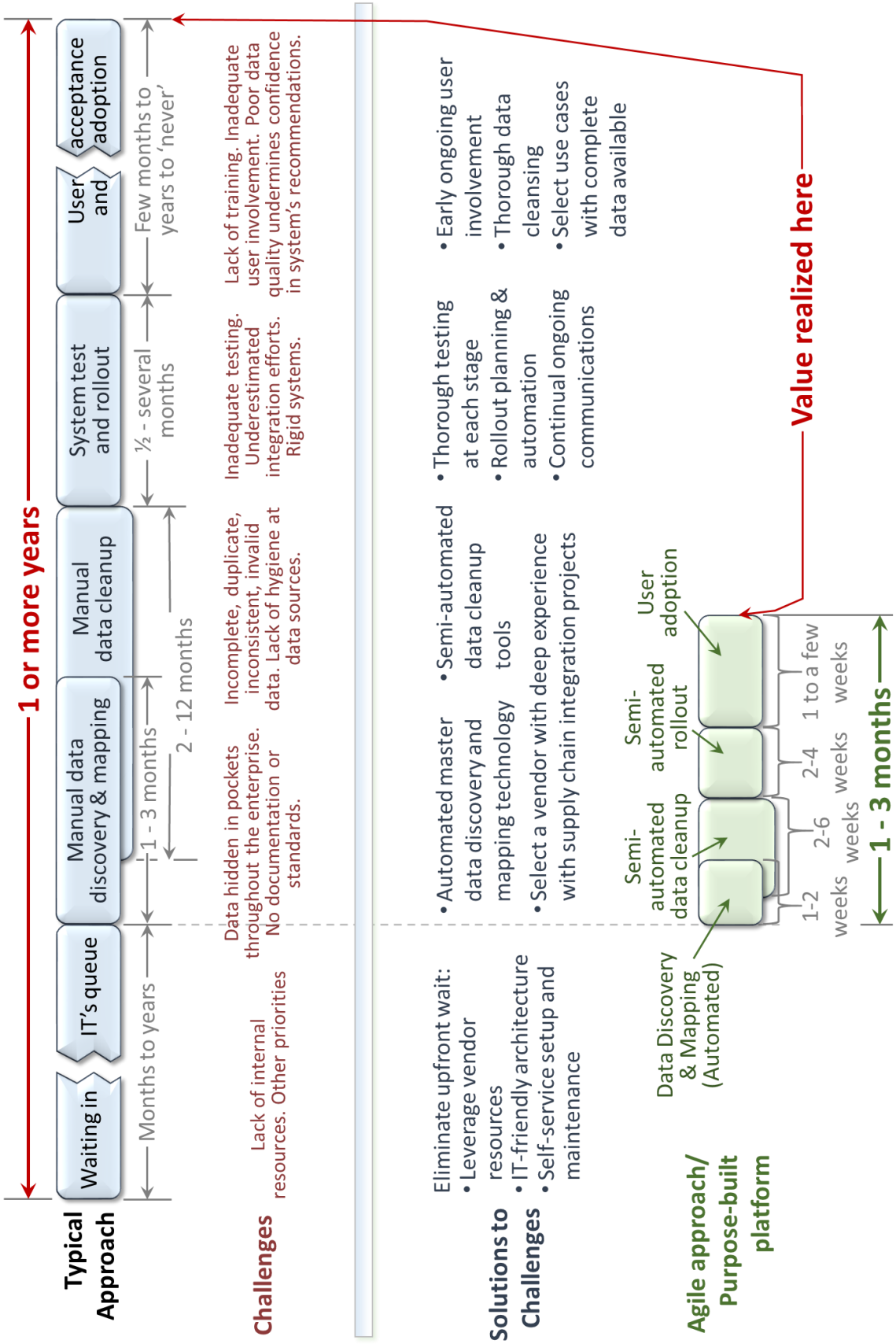

Figure 1 – Traditional Approach vs. Agile Approach to Integration—Compressing Time-to-Value

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What to Look for in an Integration Platform

The desired attributes of an integration platform depend on the intended purpose. The requirements for a general-purpose integration platform, intended to integrate any system to any other system, are different than the requirements for integration that is specific to a supply chain planning and optimization system.

Purpose-built Integration for Supply Chain Planning and Optimization

Thus, not all integration platforms are created equal. For example, virtually all integration platforms have adapters for each of the major enterprise systems (SAP, Oracle, etc.) and many also have some sort of templated mapping to bring that data into their internal canonical data model. However, these tend to be a mile wide and inch deep. In contrast, a best-of-breed, purpose-built integration platform for supply chain has depth in its specific domain. Here are some of the key characteristics to look for from an integration platform for supply chain planning and optimization:

- *Proven purpose-built templates*—This means the templates have real depth of mapping, incorporating all the types of master data that are important to supply chain planning and optimization. Ideally the level of depth, maturity, and completeness of mappings evolves and increases over time, as the solution provider encounters more situations, accommodates new data sources, and adjusts to changes in existing data sources. Thus, it is important that the solution provider actively invests in the templates on an ongoing basis. This is part of what makes integrations sustainable over time.

Preparing for the IoT Data Tidal Wave

With sensors, intelligence, and connectivity built into more and more of our physical objects and surroundings, the Internet-of-Things has the potential to provide new high value streams of data to supply chain planning and optimization engines. It also has the potential to generate overwhelmingly high volumes of data. Here are examples of potential IoT applications in supply chain:

- *Predictive maintenance*—Predictions of future failure can be key inputs for forecasting and optimizing scheduling of skilled technicians, spare parts inventory, and the required logistics.
- *Consumption monitoring*—Machines can provide predictive data on when consumables will need to be replenished (e.g. soap for washing machines, syrups for soda machines, oil or brake pads for cars).
- *Machine usage*—Forecasting when each individual customer is likely to need a new machine or system, based on their current usage, could be an input to longer-term forecasting and planning.
- *Supply-side visibility*—Data from sensors on the supplier's plant floor and dock doors, on trucks and ships, in yards and warehouses, ports and airports can be combined with weather, traffic, and other data to provide much more accurate lead times and precise ETA, feeding S&OP planning, production planning, and risk management systems.
- *Integrated retail store sensor data*—Can provide insights into consumer behavior, influencing merchandising and planogram development, as well as promotions and forecasts.
- *Cold chain temperature exposure data*—Can be used to optimize distribution, enabling a First-Expired First-Out strategy.

These are just the tip of the proverbial iceberg. To be 'future-proof,' supply chain planning solutions need to be ready to deal with the variety, volumes, and real-time streaming of all these new IoT data.

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- *Flexible, future-proofing, no-coding*—No pre-built mapping can be 100% complete for all circumstances. Thus, it is critical that the integration platform provides the flexibility to adapt and evolve. Practically speaking, attributes to look for include:
  - No-coding/visual approach to mapping
  - Rules-based, easy to customize
  - Self-documenting and easy to understand and maintain by newcomers who did not create the integration
  - Does not break upon upgrades on either side of the integration
  - Transformation logic that is independent from mapping logic
  - Robust data validation.
- *Willingness and capability to take responsibility for integration*—If the solution provider is willing to take total responsibility for doing the 'grunt work' and making the solution work, it helps take the pressure off of constrained internal resources. It also demonstrates that the solution provider has skin in the game.
- *Ongoing management of integration post go-live*—A vendor with strong purpose-built integration has a clear advantage in building out capabilities at scale for managing, supporting, and maintaining integrations after the initial go-live events. Taking on this responsibility enriches the vendor's R&D efforts by forcing them to further improve the solution, as they continually learn, fix issues, and broaden the use cases and systems they cover. Be wary of providers that don't offer to take responsibility to manage the integration once the system has gone live. Their lack of commitment may be a warning sign of the difficulties of maintaining and evolving the system as things change.

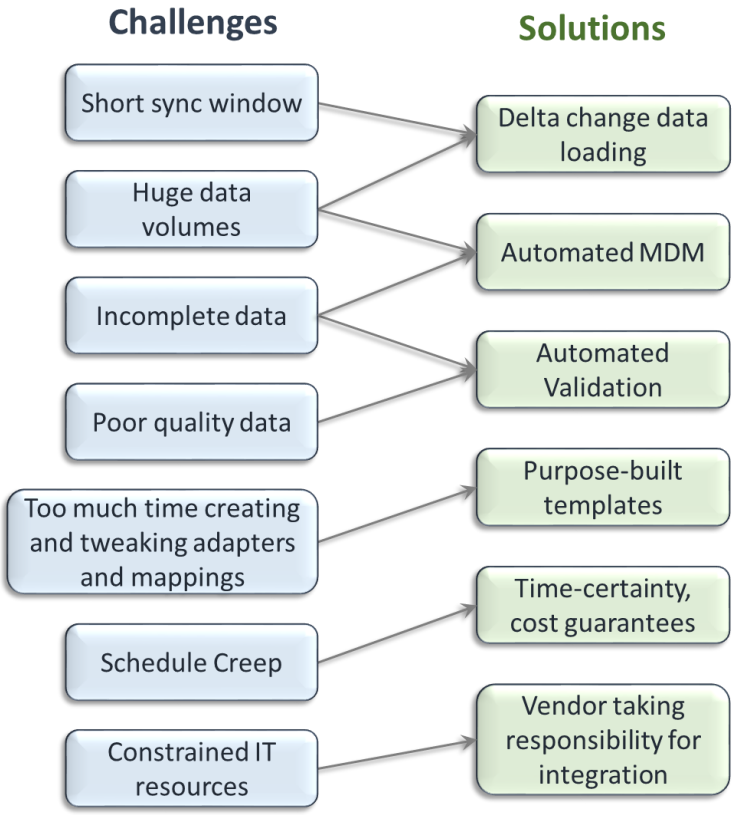

Figure 2 – Solution Attributes That Address Various

- *Price-certainty/time-certainty*—Look for a solution provider that has enough confidence to offer a fixed price and guarantees for the timeframe of the integration.
- *Automation of supply chain master data management*—The solution should include tools that can crawl through your ERP's item master and other master data, and automatically drill down on multi-level BOMs to find all the elements, correlate elements between the systems, rationalize naming conventions between different systems, identify missing data, and so forth. This is another aspect of

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'purpose-built,' as this kind of automation requires an understanding of the semantics and syntax of the supply chain data needed to feed planning and optimization engines.

- *Data validation*—The system should be able to identify missing data, data that is out-of-range, and provide dynamic, rules-based reasonableness testing logic. This could include various user-editable formulas or look-up tables to ensure the data is valid. It should include mechanisms for logging and alerting of data quality issues as soon as they occur, so they can be identified, diagnosed, and fixed quickly, as they arise, rather than after-the-fact when the damage is already done.
- *Delta-change data loading*—If the integration platform reloads the entire database from scratch each time, it will cause unacceptable performance and inability to get rapid data updates. The system should have the capability to determine what data has changed in the source systems and then upload only the changed data.
- *Unstructured data handling*—Increasingly intelligence is being extracted from unstructured data, such as social media, email, news feeds, IoT data, and so forth. Machine learning and AI are getting better and better at seeing the patterns and finding meaning and useable information from unstructured data. The method of integration depends on where this machine learning resides. If there is an external analytic engine ingesting and making sense of all this data, it may generate specific signals and insights that are then fed into the supply chain planning and optimization system. On the other hand, if the machine learning analytics are built into the planning and optimization system, then it requires the capability to ingest high volumes of streaming data and unstructured data. Makers of planning and optimization systems are currently figuring out what architecture works best for them. It is a good idea to find out how they plan to handle unstructured and streaming data.

These guidelines should help you select a supply chain planning and optimization system that has the right integration capabilities. This will be a key enabler to make rapid, agile, future-proofed integration possible.

An Incremental Roadmap to Value

An agile implementation approach drives value realization in incremental bite-sized steps. In this spirit, here is a possible sequence of steps to realizing incremental value:

1) *Problem-focused initial integration*—Using a supply chain solution with a purpose-built integration platform, focus on a single use case, finding the minimum data set needed to solve it. Don't skimp on data validation, quality, or completeness. Often the key constraint is finding the existing data that has the quality and completeness required. Therefore, data quality and completeness should be part of the initial use case feasibility assessment and selection process. If you discover the data is just not ready, it may be smarter to move to a different use case for which the right quality data is available. Flexibility in which use case to tackle first can allow you to pick the true low-hanging fruit, enabling higher confidence of a quick first win.
2) *Use case/data expansion*—Building upon the initial foundation you've built, and the organizational momentum from initial success, further use case can be implemented in succession. In addition, work can proceed on integrating additional data into existing use cases, to increase their value. This often includes further cleaning up and enhancing the data.

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3) *Build business agility and performance*—As more and more use cases are implemented, these new capabilities can be used to improve the supply network, add new products, acquire new companies, and run the business more effectively.
4) *Integrated business planning*—Adopt Integrated Business Planning (IBP) to get to the next level of performance. Once you have the right, relevant, timely data all in one place, potential supply-demand issues can be spotted early enough to actually do something meaningful about them. Then you can do interactive 'what-if' modeling to deal with changing business conditions, and come up with the best end-to-end plan, taking into account everything from end-customer demand, to the logistics, and supply constraints.
5) *IoT and unstructured data*—Look for opportunities to experiment with various use cases that leverage smart, connected machine data, as well as internal and external unstructured data. An agile, fail-fast approach to experimentation is good at this stage, to try out and discover what works and doesn't, and learn as you go.

With the right purpose-built, supply chain-focused integration tools, the implementation of supply chain planning and optimization can be done very rapidly (within weeks or months). Rapid time-to-value builds excitement and pride with the team, and momentum and support from upper management to fund further projects. Picking the right platform and using the right agile implementation approach can make the difference between getting bogged down in a painful, repeatedly delayed project vs. being the hero that brings the company to the next level of business performance.

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