The Case for Modernization, and How to Navigate an Evolving Software Landscape to Deliver an Agile, Effective Technology Platform and Support Organization in Transportation

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EXECUTIVE SUMMARY

The supply chain software landscape is changing. Enterprise IT leaders and vendors alike have embraced modern architectures that provide advanced capabilities, connectivity, customization, process automation, and artificial intelligence. Innovation, buoyed by data availability and enhanced processing capacity, has accelerated in recent years, and each of the major solutions providers and their partner ecosystems offer new capabilities poised to deliver enhancements to operations with tangible ROI and in many cases improved competitive positions.

That being said, the pivot from monolithic architectures to modern solutions can be challenging. Technology vendors understandably promote (and in some cases mandate) a migration path that provides them with cloud-based revenue streams, new services opportunities, and enhanced profitability with streamlined support on more recent versions. Their customers, however, are often faced with difficulty in defending the expense of the migration to their boards due to limited upside from new features - and substantial risk of business disruption from the implementation and cutover.

However, there is substantial value to be found if the appropriate steps are taken in up front planning exercises. It begins with a champion from the business who is looking to transform the way that the business operates, and/or how it consumes and leverages technology.

The journey can take different forms depending on the sponsor, which can be framed as IT Transformations, Supply Chain Transformations, or simply Application Modernization initiatives (typically of a specific business function).

MODERNIZATION VS TRANSFORMATION

The success of any of these initiatives will depend heavily on the investment made in a) understanding both the current state opportunities in the business that can see improvement and derive benefits throughout the journey, b) considering the changes in business strategy and the competitive landscape where new approaches can deliver market share and profitability growth, and c) the ecosystem of solutions and providers that can deliver those benefits.

IT Transformation focuses on building the platform and tools to leverage the advanced capabilities in a hyper-connected environment of modern SaaS solutions atop a comprehensive data ecosystem and platform tools capable of process automation and generating insights. Mapping the modernization of applications to fit amongst the platform goals requires an assessment of applications, their architectures, and often drives

evaluation of the market to ensure the vendor roadmap is aligned to corporate IT objectives.

Supply chain transformation starts with a focus on how products are sourced, produced, and distributed, often coupling new markets and channels or customer engagement approaches. Alongside new processes or facilities, systems requirements will undoubtedly evolve, demanding new software capabilities or selections and converging with traditional application modernization processes.

Application Modernization is, unfortunately, the most common of these. Navigating the migration from a legacy solution to a cloud based or SaaS native architecture seldom delivers near term returns on the required investment and too often drives standardization and removes earlier customizations that drive efficiency or speed to the business.

THE CASE FOR TRANSFORMATION

When faced with a need to modernize any application, the process of evaluating newcomer capabilities for simplification or optimization can deliver a lower cost, higher value architecture and roadmap for your organization capable of delivering unprecedented value and performance. Across the supply chain, modernization also offers an opportunity to embrace the cultural shifts that SaaS offers – pivoting from cyclical investment patterns that result in gradual degradation of capabilities while preventing investment in the best practices. A major gap that differentiates modernization from IT transformation is a steady state center of excellence approach – whether internal or delivered by a partner, the care and feeding of a solution in a 'stay current' environment can pay huge dividends.

The recent evolutions of software packages and the provider landscape offer a unique opportunity to reimagine how your business operates –outsourcing partners, software providers, services and support ecosystems, and innovation approaches can all be considered when developing a vision and roadmap to modernize or transform your supply chain.

Considering modernization more broadly and plotting a migration to a best-fit operating model leveraging modern IT platform tools and processes requires thoughtfulness on objectives, consensus in strategy, and collaboration in planning and execution – but the benefits of a formal process can ensure the investment required of modernization is leveraged to return optimal value back to the business.

NAVIGATING THE SUPPLY CHAIN LANDSCAPE

The impact of modern technology platforms on the supply chain technology landscape has been considerable. Leading providers having some place some cases been displaced by

disruptive newcomers and in other cases continued consolidation processes to amass more holistic suites that are now converting or collectively modernizing using modern platform tools.

Transportation ecosystems are also more connected, both from a pricing and tendering perspective as well as in real time awareness of shipment status. Probably in great markets have resulted in substantial investment in visibility as well as transportation planning optimization. Customer service processes, now tightly coupled with real time shipment status awareness, are becoming hyper-responsive to disruptions – protecting revenue and improving customer service. Further, process automation has both eliminated tendering overhead with impacts to labor costs and improved tracking while AI is streamlining freight audits and rightsizing freight spend.

Looking more closely at each of the areas, a common theme is that each of the traditional best of breed or best of suite providers are being challenged by newcomers with native modern platform architectures, standard tools and processes that reduce complexity (easing the path to improvements and innovation), streamlined implementation tools, improved supportability, and ultimately, a lower total cost of ownership. These newcomers may not meet requirements for larger organizations with specialized requirements or advanced optimization needs to manage operating costs, but they should be considered for their ability to reduce complexity in the core business process, as any shortcomings may also be addressed through partners or plug-ins that bring advanced optimization capabilities.

Alongside the plethora of newcomers that can address the core business problems, adjacent solutions have also emerged, benefitting from similar technology platform attributes such as API driven platform development to extend traditional solutions for advanced optimization or to fill gaps in data availability that prevented a holistic solve. Whether embedded within a best of breed solution or enhancing a particular capability in a tier 2 solution, finding the right mix can deliver strong benefits…and clearly the table is set for partnerships and consolidation across these providers that will deliver some interesting competition in the coming years.

TRANSFORMATION PLANNING

Beyond the software providers, it is always worthwhile to consider whether the less impactful areas of your business could be better managed by a third party with less investment or risk. With industry standard templates for onboarding and management, and thin margins, these organizations can offer lower costs with acceptable performance if that is good enough for your organization’s needs. They can also serve as a proving ground

and learning opportunities for companies in growth mode that lack the appropriate competencies for excellence but require a bridge.

A detailed assessment comparing current state capabilities, considering pain points, and injecting opportunities to adopt new approaches will define the scope. Evaluating the supply chain technology (and in many cases, business process outsourcing) ecosystem thoroughly can vet the promise of provider solutions and inform the development of a modernization or transformational roadmap complete with estimated timelines, high level budgets, and organizational impacts, building consensus on objectives and a shared purpose across the organization.

TABLE OF CONTENTS

The disruption created by modern technology stacks and the promise of SaaS solutions have reached a crescendo in the industry. On the positive side, customers embracing modern platform concepts have accelerated their ability to identify insights to better manage their businesses and deliver profitably to their customers. Unfortunately, adoption rates of these platform concepts are highly variable, and leading software providers, anxious to capture new revenue streams and migrate their customers to a more 'sticky' deployment in their SaaS environment, are driving complex and risky migrations to the latest deployment platforms. In some cases, the roadmap leads to re-implementation while in others, vendors are limiting access to the latest functionality and security standards. Regardless, expect to see punitive maintenance cost increases to entice the pivot to subscription pricing.

In contrast to past scenarios where vendors could impose unexpected fees without concerns for customer attrition, the market dynamics have changed – especially in the mid-market. Emerging technology providers are offering alternatives that are lighter weight, lower cost, and potentially equally effective at providing the core requirements, while others offer extensions to optimize critical functions or infuse advanced data into decision making or extended processes. Adjacent solutions and accelerators round out the market with agile solutions that are easy to implement and can combine with the tier 2 providers to solve real business challenges.

Our intent is to walk through the pain points and opportunities that can be addressed by modern platforms, and the trade-offs to be considered when evaluating next generation technology and migration programs. In this section, we'll begin by exploring the attributes of modern platforms, how enterprise IT leaders might capitalize on them, how various supply chain software providers are infusing them into their development and deployment strategies, and how we see leaders in the supply chain and IT space developing and defending roadmaps for modernization and/or IT transformation.

Platform Pain Points and Opportunities

For nearly 30 years, monolithic software products have reigned supreme across industries where their customers have hungrily consumed the capabilities to provide visibility and efficiency into supply chain operations. As big data, automation, and artificial intelligence transform the ways their companies collect and leverage data to improve performance, modern IT platforms seek to correct the challenges inherent in monolithic solutions, manifested by difficult and costly customization, integration, upgradeability, and support, establishing the fundamental capabilities that will define the operating models of the

future. The following characteristics are representative of the attributes that are critical to an empowering IT strategy poised to support organizational excellence, growth and differentiation.

a. Platform Architecture, Data Ecosystems, & AI: The promise of connected data ecosystems from visibility to analytics has seen great acceleration with the advancement of AI. Embedding third party solutions into enterprise data ecosystems and enabling interoperability across the software environment requires an understanding of the complexity of implementation and maintenance. Still, the value of data insights is fundamentally impacting business performance across industries.
b. Agility and Complexity: Traditional software leaders have developed broad capabilities to serve a wide variety of industry demands. The result Is complexity in both implementation and innovation. Application configurability and rules engines have evolved within domains. Low code - no code platforms and fresh looks at standardized best practices offer low-cost, high-quality opportunities in the next generation of technology.
c. Hyper-Connectivity and Interoperability: Highly customized integration processes can now be streamlined by AI infused mapping tools while API based connectivity, low code platforms, and third-party solutions foster a level of extensibility to fill gaps between applications that resulted in value leakage offer new opportunities to increase visibility and supply chain performance.
d. Constraint Aware Optimization: There is a false perception in the industry that siloed optimization engines effectively orchestrate labor, transportation, and inventory. The truth is that these algorithms have been developed to operate in vacuums, and the promise of modern platforms is that they offer enhanced data awareness into upstream and downstream processes in the supply chain, facilitating a more holistic solve based on extended constraints and additional considerations.
e. Responsiveness & Resiliency: The ingestion of external data and insights can facilitate improved responsiveness to supply chain disruptions and changes in customer demand at the same time as exploring alternative sourcing and delivery options to ensure artificial constraints do not disrupt the flow of goods and the optimal operation of your supply chain assets. Risk management has emerged as a standalone function and quickly become a critical competency for many organizations, especially those with extensive international operations.
f. Supportability & Upgradeability: Entrusting third parties with the management of hosted environments can be risky, but advances in environment management, monitoring and diagnostics, and cloud operations do offer benefits (although few

organizations can adequately articulate their investments). Most software organizations have condensed their upgrade cycle recommendations from six to ten years down to two to three. True SaaS facilitates continuous patching with the ability to adopt functionality following its release, but there are quality costs and risks associated with this approach. The impact is clear on paper, but the legacy of poor service and support from the leading vendors warrants a deeper understanding of the investment and the results across the customer base.

g. Cost of Ownership: Vendors increasingly are raising maintenance costs to drive to a three element subscription model (annual licensing, maintenance, and cloud/hosting fees) increasing total cost of ownership. Upgrades and re-implementations, integration migrations, and the variable costs of change management all pile on to the near-term capital requirements only to result in higher operating expense over the long term. Consumers of their technologies must explore options to defend price negotiations.

Software Providers and Product / Portfolio Modernization

Navigating the supply chain software provider landscape and their commitment to investment in modern platform architectures can be daunting. Strategies very across newcomers who have emerged largely due to their foundations on modern platforms, to best of breed providers seeking to converge suite level data models and capabilities, to vendors attempting to navigate a middle ground of embracing cloud operations to extend services reach, or simultaneously modernizing and reimagining supply chain functionality leveraging advanced data processing capacities. The most extreme are holistic re-writes of application suites atop modern platforms with canonical data models – highly costly, risk intensive, but compelling over the long term (especially for the later adopters).

Incumbent providers and modernization

Cloud Platforms & SaaS: Some examples to start thinking about modernization is with Oracle and what they've done with the Oracle cloud infrastructure; a focus on options across infrastructure as a service platform as a service, and software as a service launched the industry to begin considering how to modernize solutions to take advantage of cloud scalability, and also how to expand revenue streams to incorporate hosting and cloud services. Infor also leaned in on the SaaS concept developing industry centric ERPs and modular bolt on solution sets to be delivered in a SAAS environment. SAP brought forth HANA, which is less focused on hosting services and more focused on cloud scalability and inline memory while supporting canonical data ecosystem; a highly complementary strategy to their extended portfolio and the ability to derive insights of upstream and

downstream supply chain impacts. Each of these strategies are representative of modern platform approaches that could be followed by software companies and startups alike.

In the supply chain application landscape, best of breed providers began experimenting with hosting and cloud services several years ago, but as the promise of true SaaS deployments gained traction in other solution areas, a broader vision was brought to bear.

In the Transportation solutions landscape, Oracle's dedication to cloud-based environments and a leading transportation solution enabled the rapid migration of transportation to hosted environments while product organizations extended connectivity tools for improved customization and integration across a hyperconnected landscape. Meanwhile, several startups exploited modern technology platforms by focusing on AI based tools for rapid integration and implementation, delivering the core capabilities needed. This occurred alongside a rash of digital brokers developing tools to manage core transportation processes while focusing on AI based connectivity and data ingestion tools to recognize opportunities to profitably service the expansive transportation industry, first in spot markets, and then moving to contract carrier status with a focus on high service levels, and a goal to achieve preferred provider status.

Ecosystem Connectivity: Building on the availability of capacity for data processing and storage, IoT data generation, AI based data insight development, and the hyper connectivity within and across organizations has rewritten what is possible and anticipating demand changes and business disruptions through the availability of information. Supply chain planning operations have greatly benefited from this development, and streamlined tools enabling the rapid access to these insights has been a major area of focus.

Enterprise Planning to Ecosystem Planning & Execution: Traditional planning processes were siloed, but the supply chain planning software industry has evolved from functionally based capabilities to leverage visibility within the enterprise, and then to enable collaboration across sales and operations. In recent years, this has further been extended through improved coordination from suppliers on the one hand, to demand sensing and customer collaboration on the other.

Execution solutions in contrast are far less forgiving of missteps in operations management. Execution products have focused more on developing quality assurance processes for cloud services and upgrade management. Therefore, a major focus has been ensuring secure, reliable, and seamless execution migrations. Connectivity, however, has also been a major area of focus as transportation managers seek to gain visibility across the expansive landscape of carriers and brokers through standardized adapters and prescriptive methods of interoperability.

Orchestration across supply chain planning and execution is nascent in its evolution. High value use cases have emerged while companies touting control towers have sought to develop a comprehensive, actionable ecosystem across applications…but the technology debt they are facing creates barriers and little has developed. The moves by SAP and Manhattan to embrace canonical data models on consistent platforms offer promise, but the reality is that customers truly committed to rapid response to shifting demand and supply chain disruptions must look internally at their own IT platforms and disruption management tools and processes for answers.

Newcomers, Disruptors, and Modern Platforms

a. The Proliferation of Parity in Standard Functionality

Each of the major areas of supply chain software capabilities have been impacted by disruptive vendors bringing functional parity on modern platforms, and in many cases, improving upon the toolkit, methodology approach, and support services as compared to the best of breed and ERP providers. We have already seen modernized platform players such as OM partners and Kinaxis disrupt the planning space, and we have certainly seen streamlined solutions like Shipwell and then digital brokers disrupting the transportation landscape. We have also seen disruptors such as Softeon, Made4Net, and Reply having an impact in the warehouse management space by focusing on industry-centric use cases for manufacturing or order fulfillment. The expectation is the battle for the mid-market will be raged and won by these disruptive providers who bring better service and lower cost of ownership in the next 5 to 10 years, eroding the market share of the traditional leaders as they focus on portfolio strategies and struggle to uplift their platform for transformational opportunities.

b. Adjacent Technologies and Value Opportunities

In both planning and execution, the opportunity to leverage advancements being brought by innovative new entrants to the software and services landscape is also highly compelling. Many of those in the planning space have flown under the radar as the Tier 1 providers have attempted to mimic their insights, but substantial value remains through direct engagement. A specialty ecosystem of niche insights providers will continue to see growth in the coming decade. In the execution space, innovation has also marched forward to a steady rhythm, however with large organizations skeptical of the value proposition of modernizing architectures, these firms have failed to gain the traction due to them based on the value that they offer. As more organizations move to the latest platforms for their core capabilities, these adjacent solutions should be considered as part of any aspirational road map.

Planning and Defending Modernization Investment

The exercise of developing an IT platform strategy and road map can deliver tremendous value to an organization if the right approach is taken. Through facilitated workshops focused on current and future strategic differentiation, executive leadership teams have the opportunity to triangulate on the current and future competitive landscape, and how investment in and around supply chain IT can deliver the greatest value to the organization. Ideally, the facilitators will bring subject matter expertise to the table in terms of industry trends and technology impacts, challenging the leadership team's perception of how they might differentiate in the future. By defining the critical capabilities required to support an effective operating model and go to market strategy, the organization can look inward and identify build, buy, and partner strategies to uplift the current set of capabilities and hone in on key areas of investment for innovation to outpace their industry peers.

Looking forward, the urgency and complexity of implementing the future state vision will require the development and socialization of a sequential roadmap of initiatives capable of providing speed to value, targeted investment returns, and long-term strategic transformation.

Finally, developing a cadence for measuring the success of the various initiatives against the overall objectives of a transformational program and road map allows the organization to pivot where appropriate and respond to market realities while maintaining focus on and refining the long-term vision that the leaders have aspired to. This organizational consensus building then allows a more holistic approach to near and long term budgeting with a view towards positioning the organization for sustained revenue and profit growth.

Perhaps most importantly, the roadmapping exercises provide a comprehensive vision for how the transformation must develop and the long-term return on investment that it will provide. While not all initiatives will result in a positive return on investment within the preferred timeframe, the program approach offers an opportunity to transcend individual budgeting pitfalls while embracing a broader impact from investment associated with a transformational program, as well as the potential to be unleashed by developing a foundational platform to foster and expedite innovative thinking and speed to value for future investment.

The Urgency to Act

It's often said that Covid brought supply chain awareness to the board room, but the reality is that market disruptions (resulting in shifts in market share) have been initiated or accelerated over the past two decades by investment in supply chains by visionary companies recognizing the importance of customer experience. With evolutions in data

availability and insights, supply chain orchestration is poised to increase its influence through its ability to address advancing customer expectations. The Amazon effect has rippled through the mentality of consumers and now has a presence in even the most static and predictable industries, and your customers and partners are not the only ones expecting improvements – impacts to revenue growth and operating profit are also expected by boards enamored with the financial returns being generated by AI.

The expectation of data availability and hyper-responsiveness to disruptions and risk is pervasive, but many companies lag in the investment to achieve this. If they cannot outcompete with product development, they will fall victim to value degradation and become a target for a competitor with a desire for acquisition and the associated synergies their innovative approach offers.

It goes without saying that the care and feeding of legacy applications and antiquated platforms will remain a disruptive cost center, creating headwinds to investment and progression of best practices and strategic customer engagement as long as they are in place. Ransomware is a material threat, and legacy code bases and deployment platforms undeniably present risk of a magnitude that could undermine business continuity and profitability. Platform security alone offers a competitive justification for modernization; embracing the business opportunities adjacent to the modernization program only makes sense.

Modernization programs represent a large step forward in security and sustainability, but also bring the opportunity to re-establish a focus on customer experience and continuous improvement, with ongoing concentration in operational performance as a core competency. While some areas of your supply chain may not influence your operating costs or customer service capabilities, they do have a material impact on upstream and downstream processes that surely do. As investments are made across the supply chain, a modern platform will ensure that the data you need to support optimized performance and responsiveness is available.

No one would deny that competitive disruption has occurred across industries as technology has progressed. Advanced optimization capabilities, data insights, process automation, and AI have unleashed tremendous value for their investors. The ability to consume these disruptive capabilities is entering the DNA of those organizations that are positioned to capitalize on disruptions and pull away in their competitive markets. Time is running out to establish a culture focused on agility and innovation and supported by the appropriate tools and processes. Those who succeed will follow the age-old tradition of acquisition and assimilation, while those who fail will see shareholder value lost as they fall victim to those disruptive organizations at the forefront of technology investment.

Transportation System Evolution

Digitalization has dramatically disrupted the transportation management marketplace and with it the technology landscape that support it. From software providers to digital brokers to hyper connected carrier ecosystems, we have seen functional convergence, consolidation, support deterioration, and expansive innovation. We see customers investing in (but typically failing to fully capitalize on) capabilities to drive actionable responses to real-time transportation disruptions, while their technology support requirements become ever more complicated and costly. In parallel, some of the premier software providers have seen their competitive differentiation erode while legacies of putting profits before relationships have put their install base at risk. Provider strategies have diverged in focus across use cases for a) shippers, carriers, or brokers, b) domestic vs international, c) middle mile vs last mile, and d) planning vs execution, we believe it is time for enterprises to reconsider the core capabilities required to support their transportation needs, and to develop a road map to deliver a strategic architecture and supportable transportation ecosystem to manage costs while delivering the promise of the innovations available.

a. Transportation Ecosystem Evolution

The transportation solutions provider ecosystem is at a critical juncture between the evolution of traditional software providers and the infusion of new, innovative solutions concepts and services providers. There is an opportunity for operators and their partners in IT to develop a holistic approach to developing the platform and implementing the tools, solutions, and partners that will deliver optimal value. It is a perfect time to take a step back and consider a pragmatic roadmap for transportation capabilities.

The TMS ecosystem is less monolithic than its adjacent solutions, with a steady stream of new solutions emerging, followed by consolidation of maturing solutions into broader portfolios. The result is a landscape dotted with disconnected solutions, questionable stability due to lack of controlled customization, and poor support quality that is tolerated due to well recognized challenges in upgrades and migrations. Recent transactions of MercuryGate and BlueJay offer some opportunity to correct past mistakes, but these will come with considerable cost and it's not clear if e2Open and Infios are really in a position to invest in the product as they stabilize the services ecosystem and attempt to transition their customer bases to SaaS. You can certainly expect customer retention will be more challenging than historical indicators for these companies in the coming years.

Additionally, switching costs are lower relative to transportation costs than say a WMS, so software relationships are more volatile and ready for reconsideration.

The real leaders in the industry, at least for shippers, are Blue Yonder and Oracle, both of whom have seen solid progress in converting customers to SaaS environments. The challenge they'll see is more related to cost of ownership as emerging providers bring parity with core capabilities and accelerated implementation tools and timelines to minimize switching costs and provide a clear justification to migrate away.

SAP has made investments in their transportation capabilities, but lacks substantial parity relative to the leaders, and as such, are limited in scope to less mature organizations that focus on tracking versus optimization, or larger organizations that rely heavily on managed services providers. However, the cost of ownership for SAP remains high. As a result, companies such as Mastery Logistics and Rygen have emerged with advanced platforms focused on hyper-connectivity and rapid onboarding to do just that. The differentiation those tier 1 solutions bring is associated with their planning capabilities, both of which benefit from connectivity to forecasting and replenishment tools. As of now, we're not seeing the right level of focus on combining streamlined execution with more elegant planning tools. The next round of consolidations may well remedy that, with companies like Ortec or 4Flow pairing up with Mastery or Rygen to offer a best of both planning and execution suite. Formally or informally, we expect to see these relationships gain traction in the coming year.

The other disruptors here are the data aggregators and digital brokers. FourKites and Project44, and to a lesser extent, FarEye are all examples of data aggregators who were infused with tremendous capital. They did a great job of marketing, but the results to date of their value proposition. It is questionable whether they've solved the core problem they promised, and most have pivoted to solution development to address the core transportation landscape to which their data can add value (currently managed by the legacy TMS leaders we're familiar with). In this context, they represent an opportunity to refresh core transportation management solutions, but have failed to gain traction yet to be real challenger. On the other hand, digital brokerages have emerged with tech that can provide the same core transportation functions (granted they've managed these processes as brokers at scale), and they've accumulated great insight into the profitable engagement of carriers and orchestration of shipments. The tech is solid and can extend beyond the broker ecosystem for core TMS functions. As such, companies like Transfix are also poised to follow a path similar to the one mentioned for Mastery and Rygen.

b. Core Functions and Value Drivers

Transportation management solutions typically evolved by focusing first on execution (tendering, tracking, financials) and then expanding into planning (routing, pricing, and load planning (and ideally, these three as part of one engine/solve).

Perhaps the biggest question when considering the best fit TMS for your organization is the importance of robust planning capabilities which can include load and route optimization as well as routing and tendering decisions. For manufacturing organizations, much of the transportation plan will be dependent on maintaining safety stock in the distribution centers and fulfilling customer orders, so upstream interdependencies with supply chain planning and order management tools can greatly influence performance.

International and global trade requirements include highly sensitive customs processing capabilities, an increased need for visibility throughout those processes, and connectivity to trade management or taxation functionality. This may be increasingly important now as the administration considers tariffs and surcharges based on both country of origin and also destination ports.

Fleet optimization (largely addressed by core TMS from a planning perspective, but brings complexities of asset tracking, driver scheduling, truck maintenance, etc) is another considerable area of functionality needed by carriers and shippers with private fleets. Quite often fleets require specific route planning capabilities typical of dedicated routes, but there is also upside with adding dynamic stops or backhaul opportunities to the mix.

Digital tracking and insights into potential disruptions came on in force in recent years and have largely matured with large customers leaning in on the front end of investment. Now the challenge will become driving a higher level of automated actionability associated with those insights which requires additional insight into interoperability across the broader transportation platform.

Finally, there is a broad category of data aggregators that have used integrations and screen scraping technology to mine data from across the transportation landscape. In essence, these are multi enterprise hyper connected solutions that have gained recognition as digital tracking solutions, but also have seen applications in freight marketplaces, pricing insight solutions, appointments scheduling capabilities, and electronic bill of lading and ASN connectivity ecosystems.

c. Differentiation across the landscape of providers

Functionality: Digital brokers and data aggregators have reached parity for basic execution capabilities, and will be taking share from the larger providers for the more basic

operations, though there is upside for tightly coupled planning and execution capabilities which if needed would require a partner solution. A single provider approach can deliver streamlined implementation programs, but beware that at least a few of the prominent suppliers of these solutions are in essence modularly based and lack tight coupling of the solutions, meaning there are limitations to continuous planning as the execution of those plans develop and evolve.

Portfolio: A portfolio-based approach can deliver streamlined implementation programs, but those who offer them have failed to invest and haven't captured many of the synergies available. Perhaps one exception is the planning / transportation landscape where inventory replenishment and load planning can deliver strong asset utilization. The more dynamic world of order fulfillment (a focus on order promising, sourcing, warehousing (ie order processing), and transportation) lacks a shared logic model in the industry.

Technology: SaaS adoption has progressed well in the transportation management technology space. There is, however, an aversion to multi-tenant environments and the associated risk, especially considering patching and upgrades. Validating vendor strategies for quality assurance processes should be central to vendor interviews and selection. How to embed automation and streamline connectivity across the ecosystem is a challenge we've seen some vendors try to address but more robust organizations take ownership of upgrade management and quality assurance, eliminating (with solid reasoning) some of the upside of SaaS.

Overall: To revert back to the promise of modernization and what companies should aspire to in terms of capabilities for their transportation ecosystem, it's really about focusing on the best fit for solution for each individual area and then rationalizing the vendor ecosystem for the right balance. Inserting automation capabilities and hyper connectivity as a critical requirement will round out the platform approach and ensure the investment road map will deliver the promise of modernization.

Critical Selection Criteria: There is no silver bullet for a transportation solution that will service the needs of every shipper and/or carrier. So, it is important to identify the most critical areas of your transportation landscape and to develop selection and migration strategies to support those technologies in an effort to templatize the approach and replicate it for the areas where more basic solutions or partner strategies will deliver the needed capability. That being said, capabilities in load and routing optimization as well as global trade capabilities are paramount to understanding the best fit, alongside industry and product centric requirements handling. Beyond that, revert to usability and cost of ownership as the primary value drivers.

As the basic requirements and the criticality of those requirements are understood, an appreciation for the portfolio capabilities of those vendors best positioned to deliver should be considered alongside the general experience of customers of those vendors and the strength of the relationship which may drive a streamlined portfolio strategy with economies of scale, but also may suggest diversification for risk mitigation purposes.

For basic platform technology such as process automation and integration while vendors are stretching their comfort zones to deliver additional capabilities, these come with a price that should be challenged internally from an opportunity cost perspective in terms of control and ROI. Likely there are synergies in other areas of the business that warrant investments in these areas if a strategic vendor solution for process automation and integration platforms has not been established. For specialized transportation capabilities, a substantial look at tier 2 and tier 3 providers is certainly warranted as parity in the industry has delivered a plethora of providers that can support these functions with high levels of service, less risk, and lower cost.

d. Developing the list of vendors and partners for evaluation

With a broad array of potential suppliers, RFI's may be issued across a wide spectrum of candidates. Likely those with applicable success stories and a competitive pricing strategy will lean into replies and offer compelling alternatives. For areas that may be recognized as likely later phase requirements, RFIs and interviews with the providers of international transportation and trade management are warranted to anticipate a future state architecture and the complexity of a longer-term roadmap, but we'd stop short of full architecture and design until preceding phases are past design.

Short listing a few vendors for RFP with a focus on the core functional need is also in the interest of the organization in order to streamline the education process and drive more effective consensus and decision making. It is advantageous to consider at least one portfolio play here but to urge a focus on the problem at hand and a heavy consideration to the cost benefit of the options.

e. Anticipating Organizational Impacts

While the broader ecosystem of solutions and providers is relevant, the more important element is how your organization will invest in the technology platform and skills required to consume them versus judging the pros and cons of various road map opportunities to be addressed in coming years.

Organizational disruption will be dependent on the severity of change to which you are committing at any given time. However, if your organization is committed to taking advantage of the capabilities that come with the modern platform, it is advantageous to

assign a transformational lead that is deeply familiar with the transportation ecosystem in which you operate and capable of facilitating change across multiple areas of your organization including operations and IT. This individual will bear responsibility for strategic planning, budget tracking, and change management. This is also an area where a strategic advisory such as SCT can play a pivotal role.

In the IT organization, trade-offs will need to be evaluated between partner relationships and building capabilities in house. Expanding the familiarity of an enterprise architect who can orchestrate both internal and external integration resources is a key activity. Adding skills associated with process automation and integration to your Center of Excellence if they do not already exist will bear benefits both in the transportation ecosystem and beyond. Finally, identifying enthusiastic and capable leaders will smooth the change management process and deliver a higher level of success.

Modernization Planning

After reviewing this paper on the promise of embracing a more holistic value-based approach to modernization through transformation, we hope you have achieved a bit of an appreciation for the importance of a thoughtful planning process to ensure organizational alignment on the objectives and an educational process to explore the recent developments in supply chain best practices, software, and services providers.

Our methodology focuses on first developing consensus across organizational leaders regarding the importance of each functional area under consideration to the long-term strategy of the business, including the critical capabilities needed to achieve that strategy. By mixing stakeholder interviews and educational sessions to develop a point of view on success factors across the organization, SCT plays back key concepts for consensus building. Applying corporate IT strategy, tools, and capabilities to the functional requirements and opportunities available to improve performance within these supply chain functions while balancing value, cost, and complexity, we'll deliver a prioritization model enabling a thorough approach for exploring options and developing a business case and road map for the migration.

During this exploration, it is highly recommended to thoroughly vet any and all options on the table including:

- Incumbent strategies: many vendors have dramatically altered their product roadmaps to align to a broader platform strategy. This may include native SaaS development strategies with cloud operations implications, integration platform mandates, the re-architecting of data models, and reimagination of application logic. These uplifts may necessitate a partial or complete reimplementation of this solution.
- Alternative solutions: many newcomers to the supply chain software landscape have built upon modern platforms and quickly achieved parity for the basic capabilities required to operate supply chain solutions. With streamlined processes for implementation, less complexity and system configuration, fresher support models, and a lower cost of ownership, these solutions can easily replace legacy products that have become burdensome to manage.
- Accelerators: Many smaller but high value solutions providers have emerged leveraging unique access to develop data insights or pragmatic approaches for the extension of application logic or interoperability across solutions that are worth considering from a value creation perspective. The landscape is broad, but the promise is considerable, and understanding how these bolt-ons might be

consumed as an adjacency to the core applications and platform provides quick win opportunities.

Once your organization’s future state requirements have been identified and prioritized, a combination of Requests for Information (RFIs) And Requests for Proposal (RFP's) offer opportunities for education and the delivery of a short list of contenders to engage in the selection of core Solutions or services and accelerators to round out a future state architecture design and road map planning process. The more intrusive or costly of these solutions should certainly be vetted through an intense process of demonstrations, scoping and staffing workshops, and contractual negotiation prior to commitment.

The final deliverable from our planning process should not be limited to an implementation plan, but rather focus on both longer-term road map opportunities, and also steady state staffing plans and partner arrangements to ensure the appropriate level of reliability resiliency and continued improvement warranted by the required investments.