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Gnosis Freight: Harnessing Data and Low-Code to Shipping Container Visibility and Logistics

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Abstract:

Gnosis Freight employs low-code/no-code development tools to provide container visibility information for shippers. The case takes place as U.S. supply chains are still reeling from the impacts of the Covid-19 pandemic. Shipping costs have sky-rocketed with shippers facing huge uncertainties as shipments are marooned on container ships or in container port yards. Accustomed to reliable pick-up and delivery forecasts at reasonable rates, they find themselves with unreliable delivery forecasts or unknown locations of their shipments. Gnosis Freight, by combining data from several sources, provides logistics and transportation managers with near real-time information on their shipments. Gnosis solutions engineers, armed with low-code and no-code development tools, are able to quickly install customer-tailored container visibility portals with little adverse effects on the customer's existing work processes and data flows. The implementation speed of these edge development tools provides Gnosis Freight with a strategic advantage over competitive offerings that require major changes in a customer's operations. But the company also faces issues with its own data supplier, giving students a specific "make vs buy" problem to analyze.

Keywords: Low-Code, No-Code, Visualization, Logistics, Strategy, Procurement, Container, Visibility, Make vs Buy.

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1 Introduction

In May of 2022, Austin McCombs, co-founder and CEO of the international freight visibility company, Gnosis Freight (Gnosis), described his vision of a low-code empowered industry:

We are profitable, self-funded, and, since start-up, have yet to lose a customer. The market for international container tracking with some 30,000 BCOs (or Beneficial Cargo Owners) is massive and largely still in search of better container visibility. But freight shipping is only one of several large industries that low-code can help to transform. Banking, inventory management, and financial management are promising industries where technological innovation has stalled or is, as with freight shipping and logistics, far behind where it could be. Our approach to digitizing an industry with low-code can be applied to them all.

Low-code software development was a key element in McCombs' and Gnosis' initial strategy. He described its evolution within the company:

We were a typical small software shop, looking for customers with problems we could solve. One was a furniture company that needed a factory management app. We gathered the requirements and put three developers on it. Six months later, it was a total bust! We had to start over. What the customer said they wanted and what they needed were quite different. After all, clients are not information tech experts, and software is expensive to build. We needed a different approach, and we needed it fast! We pivoted to a prototyping mindset fueled by a rapid development methodology. That led to low-code and Knack, a low-code platform provider. In just two weeks we delivered our first prototype.

Initially, McCombs' team saw prototyping as an analysis tool that, via repeated phases of iterative usage and modifications, could eventually produce solid requirements. These would then serve as a detailed blueprint to guide a traditional system development process. To McCombs' surprise, he and his team ended up on a different path:

It was supposed to be temporary; we'd create versions one through five, or one through fifteen, and once we got the requirements nailed down, we'd restart and code the bullet-proof version. But, with the help of our low-code supplier, Knack, we found we could produce a production quality system. We ended up with a robust technology stack that included powerful low-code tools along with code hand-written in more traditional languages such as Javascript. This gave us great benefits. The user learning curve was less steep and, when the system went live, the client was already on board; both expedited acceptance and adoption. We could also hire a new generation of developers who were problem solvers with industry expertise but didn't require programming skills beyond familiarity with Excel. Thus, they got much closer to the client and quickly mastered the low-code environment.

While using a low-code approach in the early days of the company was vital and reduced software development time to a fraction, one challenge was always looming: guaranteeing the quality of the data. McCombs kept wondering: Should he stick with buying the data, or rather build our own data engine?

As McCombs described, an incident with their primary data supplier elevated the issue:

The pot boiled over when several of our primary vendor's container tracking systems went out. It had happened before and been quickly resolved, but not this time! A day goes by, then another. We are sending them dozens of emails and dealing with even more questions from our own customers who could no longer track their goods. Day three comes and goes, and still no service. Moreover, we had reason to believe that for their bigger customers service had already been restored. But we were still hearing, 'Hey, we'll get back to you when we can.' We had no satisfactory response for our customers, and our credibility was cratering along with the perceived quality of our service.

2 Gnosis Freight

In 2017, Gnosis Freight, based in Charleston, SC, was founded by McCombs and two leaders of ASF Global, a local freight forwarding company. Their vision was lofty: "revolutionizing industries that have

been left behind by technology.” The Gnosis Companies’ website described often overlooked industries that captured their interest and fueled the founding of Gnosis Freight:

Some refer to these industries as ‘boring’, but we know they are far from that. Technology resistance is not a sign of weakness, but rather proof of strength in the traditional way of doing business. We focus on maintaining the elements that have kept these industries great, while offering solutions to the problems that have become unavoidable.

For companies in such industries, Gnosis’ overarching vision was to harness the tools of artificial intelligence, machine learning, and data science to their business operations:

While we do not yet know the full impact of these technologies, we are confident in one thing that many people are disregarding: they offer extreme benefits TODAY. We focus on taking these technologies out of the ‘experimental stage’ and package them into solutions that provide immediate and tangible results.

Gnosis’ first target was global transportation and logistics. They would provide importers, exporters and domestic shippers with international visibility of their shipping containers. Gnosis’ mission was concise: “help logistics companies work together better.” Their markets were shippers, freight forwarders and, down the road, booking agents and drayage (trucking) companies. Their first freight forwarder customer was ASF Global, led by McCombs’ co-founders. Almost all customers, including dozens connecting through ASF Global’s portal, were shippers. Jake Hoffman, Gnosis’ Chief Technology Officer, explained:

Many shippers rely on third-party vendors and freight forwarders to get their shipments from one point to another. Some may eventually decide that maintaining in-house control over shipment logistics will be more cost-effective. These BCOs need worldwide visibility of their container shipments. So too do larger BCOs with more sophisticated logistics operations that rely on a diverse set of third parties; they often find it difficult to aggregate data from these many suppliers. In either case, we provide them with visibility with our Level 1, Track & Trace, product. Via a Gnosis-provided portal, customers can see where their containers are in real-time, and where they are going—using only a MLB ID (or Master of Bill Lading Identifier).

Among Gnosis’ customers in 2022 were tool, electronics and garment importers, chemical exporters, tire manufacturers, furniture wholesalers and retailers. These included some of the top ten movers of containers in the world.

Smaller customers often relied on unsophisticated information systems (IS) with little or no dedicated support personnel. Their IS tended towards ad hoc solutions, often little more than email, fax, Excel spreadsheets, or even hand-written notes that they used to track their shipments. Rarely were these tools able to accurately reflect the location or current status of a container. But even far larger shippers struggled with tracking and managing their shipments due to visibility issues. The capability of providing BCO’s and freight forwarders with international container visibility was an overarching selling point for Gnosis. They also believed their visibility service could also be of potential value to booking agents and drayage operators.

Gnosis’ website described the frustration that attracted customers to their solutions:

Our customers told us they were tired of countless spreadsheets and emails. The Gnosis Platform gives our customers ONE place to seamlessly collaborate and share data with their partners. Gnosis removes data out of its previous ‘silos’, opening the floodgates for improved ways of doing business. Each module and feature of the Gnosis Platform was inspired by a specific customer’s request or pain point.

McCombs estimated that as many as 40 of the firm’s 50 product features or modules had emerged from customer requests, contributing towards Gnosis’ objective of providing “an ecosystem that allows partners in the supply chain to collaborate more efficiently and effectively.”

Among the “partners” who handled a shipper’s container, or information about it, were port terminals, container ship carriers, custom agents, freight forwarders, railroads, drayage, warehouses, insurers and booking agents. All had information systems, but of varying quality and degrees of intercompany connectivity.

3 The “Box”

At the heart of Gnosis’ business model and of the shipping ecosystem was the ubiquitous shipping container, or, as it was often called, “the box.” These usually standard-sized twenty or forty foot long containers linked BCOs to terminals, rail, truck and sea carriers, warehouses, and freight forwarders. The boxes carried products from one logistics organization to the next, and finally to their destination. Except for mandated customs or security inspections, containers remained securely locked throughout their journey. Completing the cycle, empty boxes were then transported to a location where they would be required for further shipments.

Prior to, and throughout World War II, most non-commodity merchandise had been shipped using “break-bulk” handling. Non-uniform crates, boxes, and bundles were individually loaded by cargo nets, cranes, and stevedores into the holds of freighters. Break-bulk was beset by high labor costs, injuries, labor strife, delays, and lost or misrouted merchandise, as well as organized or opportunistic thievery. In 1956, Malcolm McLean, founder of McLean Trucking Company, frustrated by his drivers’ long waits at port terminals to pick up or drop off cargo, refitted a World War II cargo ship to accommodate 58 35-foot chassis-less truck trailers. Shipped from Newark, NJ, to Houston, TX, the voyage was a well-documented success, one fueled by a simple, but transformational, technology – “the box.”¹ In 1956, handloading a ship had cost \$5.86 a ton while McLean’s container ship could be loaded for \$0.16 a ton – a 36-fold improvement (Ebeling 2009). With instant huge improvements in labor costs, pilferage reductions and shipping durations, freight shipping was forever transformed. Standardization of container size and innovations in the design and size of container ships, railroad cars, trucks, ports, and the containers themselves provided further efficiencies. Containerization hastened the growth of global trade; consequent improvements in delivery predictability helped to spur both off-shoring and just-in-time manufacturing.

While the freight container may have been simple, the journey of any one container usually was not. A container and its supporting documentation passed through many organizations on its journey, say from a manufacturer in Shanghai to a Walmart Supercenter in Los Angeles, and then, once emptied, back to Shanghai. Within this container life cycle were truck or train transport at either end, layovers in a terminal’s yard, perhaps another in one or more warehouses, and, sometimes, security or customs inspections. All of these third parties provided and required knowledge about the container, which, among other things, might include its current location, contents, and time stamps of various milestones as it moved towards its destination. Moreover, destinations were not necessarily fixed at the time of shipment. A retailer, for instance, might elect to change the distribution center a container was destined for while the container was still in transit. Or, as commonly experienced during the Covid pandemic, notifications of shipping delays needed to be sent to and accommodations made by downstream supply chain participants and the final recipient.

Information systems played a critical, if often disjointed, role in ensuring that containers reached their intended destination. While each player in the logistics system had its own information support system, neither was woven into an overarching ecosystem-wide fabric. Thus, an importer or exporter might at any point in time have inadequate information regarding the location and status of goods in transit. It was this lack of visibility that propelled Gnosis’ business strategy.

4 Developing Information Systems with Low-Code

Business information systems implementation solutions are arranged along a continuum. At one end are information systems developed from scratch using a rigorous life cycle of software development. This approach is often prohibitively expensive, slow, and vulnerable to failure from inadequate requirements analysis. If done well, such systems can have the advantage of tight alignment with existing business processes and related information systems.

At the other end of the system implementation continuum are purchased applications. Typically far less expensive and more quickly installed, if not necessarily readily accepted, they lean towards a “one fits all”

¹ By 2021, there were over 5,000 dedicated container ships operating throughout the world with a combined capacity of over 24 million 20-foot container units (TCUs). The largest of these could accommodate 24,000 TCUs.

solution rather than one that tightly aligns with existing business practices and workflows; thus, the client's business work-flows must evolve to fit the software rather than the other way around.

In between are customizable ERP systems that can go either way; they can either be implemented as plain vanilla solutions and apply standard best practices, or they can be customized. In the case of the latter, a fair amount of programming and domain-level expertise is required. Apart from being expensive, tailored implementations take a long time and, once installed, cannot be easily changed.

An emerging alternative, one made possible with low-code and no-code tools, is the idea of “enterprise flexible software.”² Acknowledging that enterprise software is typically difficult to change, tools that provide low-code, or even no-code, make it possible to modify software with little to no programming background. The goal of “enterprise flexible software” is to put the responsibility of development into the hands of domain-level experts that, armed with the right tools, do not have to have a programming background.

The terms low-code and no-code, or, collectively, LCNC, refer to a way of instructing a computer that is radically simplified, and that requires either little (low-code) or no (no-code) advanced programming expertise at all. The benefits claimed for LCNC include reductions in cost and complexity, much faster development, and putting more of the solution development process into the hands of those experiencing the problem or having greater expertise about its context. Particularly the latter has blurred the lines between a developer in the traditional sense and a user, as reflected in the term “citizen developer” (Sanchies, García-Perales, Fraile, & Poler, 2020; Lebens, Finnegan, Sorsen, & Shah, 2021).

In a LCNC environment, programming – or rather configuring the system – is done by selecting among options, e.g., modifying the look and feel of the user interface by dragging and dropping fields or renaming them. As described below, LCNC tools powered Gnosis' business strategy of very quickly and inexpensively providing new customers with container visualization information without the need to significantly modify existing work processes.

5 Services Provided by Gnosis

Gnosis Freight offered prospective customers a range of platform-based services at varying price points and with the promise of customization to each customer's current workflows (see Exhibit 1). Gnosis' first level of service, international container visualization with track and trace capabilities was usually immediately appealing to prospective customers.

5.1 Level 1: Track and Trace

Track and trace (T&T), was designed *“to give those who manage the logistics the power to focus on those issues that are relevant to them, rather than spending countless hours identifying the issues.”*

With only a customer's Master Bill-of-Lading (MBL) number, Gnosis' T&T provided a real-time status report of all containers associated with a customer, including a map view. T&T provided information for critical milestones during the container's journey; among these were the time a container arrived at the terminal (in-gate), was loaded on vessel (LoV), a vessel's estimated time of departure (ETD), a vessel's actual time of departure (ATD), the vessel's current estimated time of arrival (ETA), the vessel's actual time of arrival (ATA), the time the container left the ship (discharged), and the time the vessel left the terminal (out-gate). Status information was also provided with labels such as “out for delivery,” “at terminal,” “at rail terminal”, “on rail”, “awaiting discharge,” and “on water.”

T&T visibility was augmented by filtering and display capabilities, for instance, data could be filtered by carrier, terminal, line, destination, overdue status, priority status, date of arrival, and so on. Data could also be sorted, and even renamed in the report, or in alternative display formats such as pie or line charts. For users that valued visual evidence, container locations could be displayed on a geo map. Visualizations could be accessible from mobile phones as well as from a customer's desktop. Notifications (called Gnotifications) and reminders could also be set up, for example, to send a weekly status report or to send an email if containers were delayed, as CTO Hoffman described:

A customer was charged a lot of money in demurrage and detention fees [see glossary] for containers left at a terminal yard for too many days. Alarms could be set to draw attention to soon-to-be penalized containers. That's a typical level 1 service.

² A term used by Austin McCombs.

T&T was Gnosis' universal, and most prominent, service offering. At initial meetings with prospective customers, the Gnosis sales team often demonstrated T&T capabilities using the prospective customers' own active shipment data.

Other useful features, many implemented with low-code, permitted customers to manage their user base by limiting access to specific screens, filters, or data fields on a need-to-know basis for different roles. For example, a receiving clerk at a particular warehouse might be authorized to see information on containers coming into his/her warehouse by a particular carrier only, or a customer's drayage supplier might be given access to containers they are transporting that day.

Tailoring a new customer portal, done by the Gnosis solution engineer, required little coding. Given that T&T customer portals differed only slightly from customer to customer, even across industries, pre-specified templates were extremely useful for quickly custom-tailoring requested variations. Data visualization, login management, and customizing specific filters and data fields to specific roles were some of the key features implemented using LCNC.

The backend, by contrast, relied on third-party data providers to feed the appropriate data into T&T's capabilities. To track a container around the world, customers not only wanted to see where the container was on the ocean, but also whether it had entered the port yet, whether it had passed through customs, or had been loaded on a truck already. This type of data was purchased from a data provider at a fee dependent on container volume that initially totaled several thousand dollars per month. As their business grew, that cost had become substantial.

Gnosis advertised that its visualization T&T tools saved 7.5 hours for an average customer, eliminated close to seventy spreadsheets, and avoided 300 emails. Together, these savings were estimated to be 100 USD per container.

5.2 Level 2: PO Management and Deeper Visibility

Level 2 service offerings were extensions from the T&T product. The goal of Level 2 services was to combine container visibility drawn from T&T sources and container content visibility data drawn from the customers' internal systems, as CTO Hoffman described:

A company shipping tires to an automobile manufacturer needs to know when and which tires will reach the manufacturer, otherwise production may come to a halt with potential losses of hundreds of thousand dollars per day. In order to offer this kind of service, we integrate our L1 container visibility data with purchase order data, typically pulled from the customer ERP system.

By combining T&T data with customer purchase order data, customers were able to follow and plan actions based on container contents. Thus, Gnosis customer solutions became more customer-specific.

5.3 Level 3: Enhanced Collaboration

Level 3 services targeted the supply chain ecosystem. These service offerings often involved moving up or down the supply chain by providing services across multiple parties that were adjacent in the "container journey."

A typical example included the booking process that involved multiple parties, starting with the creation of a purchase order, sending it to a supplier, the supplier then accepting the order and communicating with a booking agent to book a slot, and the subsequent approval of the booking. Gnosis was able to show all of these interactions between supplier and customer, along with the requested space from the freight forwarder and its status, in a customer's portal. Other examples included filing ISF forms, managing invoices, providing a yard, drayage, or warehouse view of the data, or managing the scheduling between a freight forwarder, a trucker, and a warehouse. In this latter instance, thus allowing customers to define user roles that allowed each party to effectively communicate with each other and see each other's status.

These projects were time-intensive as they required a thorough understanding of the proprietary processes, communication with all involved business partners, and a substantial hand-coding effort.

5.4 Level 4: Tailored Advanced Analytics

Gnosis recently had begun offering a new level of service that harnessed advanced analytics and machine learning to customer-tailored solutions. The first Level 4 customer, a large importer, relied on many drayage firms to transport containers to numerous distribution centers and warehouses; the requirement was to optimize the assignment of truckers to routes so as to minimize costs and time. Gnosis combined T&T data with constraints provided by the customer, including the minimum and maximum number of containers a trucker was able to transport in a week, and current rates associated with the various routes. Gnosis software engineers crafted code that did route planning and automatically updated assignments as constraints varied, for example as the trucking rates changed or as more trucks became available. While the “drayage optimizer” module required some hand-coded machine learning functionality, the frontend for specifying the parameters from the portal had been created in Knack and was easy to use. The customer compared the interface favorably with other solutions considered:

It was eye-opening to have that hands-on ability as opposed to the other cookie-cutter, out-of-the-box solutions.

It was also beneficial. That customer estimated the functionality saved her \$100,000 per month.

5.5 Pricing

While competitors often priced similar web-based services by the number of seats authorized to use the system, Gnosis’ Level 1 and 2 pricing varied by volume of containers supported. A Gnosis customer, shipping 500 containers a month, was charged one rate per container. At higher volumes, and in stages, the per-container price would go down. The cost of Gnosis’ services were trivial compared with total shipping cost. In June of 2022, the full cost to ship a 40 ft container from Shanghai to Los Angeles was about 8,700 USD, down from over 12,000 USD nine months earlier, but still a big jump from less than 2,000 USD prior to the pandemic.³

6 On-Boarding a New Customer

Implementing a Level 1 service into a new customer’s business took anywhere from three to four weeks, usually with a meeting held each week. At the first meeting, a Gnosis solution engineer worked with the customer project champion to identify MBLs and the identities of the various third parties that handled the customer’s containers. Typically, this information was scattered among various spreadsheets or flat files,

Solutions engineer, Luke Stageberg, described what happened next:

With complete and clean MBL data, the customer’s trial portal might be up and running a day after our first meeting; at that point we have the ability to track their containers. In meeting two, we show them more on how their portal works and give them a test drive. That sparks new ideas as they get excited about the possibilities. They begin to make suggestions as to how to make the portal’s interface fit their own processes, say by changing field names or providing different views.

Typically, using low-code front-end tools, we can make these basic changes in a couple of hours versus a traditional development process that could take weeks or even months. For instance, we can change column labels, or screens can be sorted in the manner they wish. Different data views can be created, or the ones from our basic template modified. At this point, the portal is not yet integrated into their work processes, but they are seeing how it will fit. At the end of the meeting, we leave the customer’s project leader with a login so he/she can continue to try it out and maybe demo it to others. He/she becomes the portal’s champion which makes eventual adoption go smoothly.

CTO Hoffmann described how the new visualization impacted new customers:

The milestone data available from the Gnosis Platform often exceeded customers’ expectations. Workflows begin to evolve as they get used to having access to this new data.

³ By October of 2022 the cost had declined to \$2412.

Sign-off occurred after the third or fourth meeting. By then, the portal's look-and-feel had been tailored to the customer's existing workflows. Other members of the customer's transportation and logistics team had been provided with login credentials and been authorized for "need-to-know" data access and role-specific views. Post signoff, the Gnosis solution engineer remained on standby for subsequent modifications, upgrades to higher levels of service, or requests for functionality not yet embedded in Gnosis' product portfolio. Stageberg described this latter possibility:

Customers come to us looking for support for distinctive business processes that, once we have addressed them, can sometimes be turned into new capabilities or even a marketable product. Solving customers' unique problems and, occasionally, being able to build a new capability or product around them are among the most rewarding parts of my job!

7 The Gnosis Team

Gnosis described themselves as "a team of data scientists and software engineers." Founder McCombs had degrees in MIS and Business Analytics from Auburn. CTO Jake Hoffman, who had joined Gnosis in 2018 as a data scientist, had an undergraduate degree from Auburn in Chemistry, and a master's degree in Quantitative and Computational Finance from Georgia Tech. Backgrounds of more recent team members included investment banking, credit risk analysis, operations management, math, logistics, business intelligence, engineering, software engineering, sales, supply chain, and finance.

While Gnosis did require team members with strong software engineering or computer science backgrounds for developing modules, they did not require many. By contrast, customer-facing team members relied less on programming expertise and more on problem-solving skills.

8 Knack: A Low-Code Provider

Gnosis' customer portals, among other tools, initially relied on the low-code development platform, Knack, a small start-up based in Pennsylvania. In 2012, Knack had started out developing websites, but soon discovered their low-code "Knack Builder" development tool to be a marketable product. By July of 2022, Knack had over 5,000 customers, but faced many competitors in a highly fragmented industry.

Gnosis was one of Knack's earliest enterprise customers and had become one of their largest. Because of Gnosis' use case and growing technical requirements, they were both a challenging and innovative partner. They were unique, as Steve Palmer, Knack's first hired employee, now responsible for sales and partnerships, explained:

Most of our clients come in looking for something to help with their own problem, but Gnosis wanted to solve their customers' problems. Those customers all required simultaneous secure access to Gnosis portals deployed in Knack. Together, they had millions of records. Speed, scale, and complexity became an issue. We spun up dedicated resources for Gnosis which allowed them to grow while not burdening other customers with conflicts from shared servers.

As he described, Palmer valued the special relationship they had forged with Gnosis:

Gnosis has been a great partner. We've been fascinated with what we have seen them create and the invaluable feedback they continue to provide us. Within the last year, for instance, we introduced a new version of Knack Builder. Their feedback has helped shape the product into its current form. We also understand that there needs to be a way to integrate their hand-coded modules with Knack. Having more people who have the ability to code will only enhance the value of Knack. We are not going to turn away from that.

Knack was instrumental in the early stages of Gnosis' growth. Over time, however, as McCombs described, more and more hard-coding entered Gnosis' stack.

Low code was critically important for us when we were getting started. As the company grew and as products became enterprise level, our clients too grew larger. Unfortunately, low code tools today often are not viewed as fully prepared to service Fortune 500 companies on an enterprise level. Still, many companies can use LCNC effectively, and they should. We still will as well, even with our Fortune 500 clientele, as much as we can and where it makes sense. Today about 80% of our software is hard-coded, including for much of the functionality that is shared across all customer portals. We continue, however, to use low-code for rapidly tailoring

our offering to the unique requirements of individual customers, particularly at the user interface level.

9 To Build or to Buy?

Having successfully created a competitive edge with their T&T product by using LCNC, the data availability disaster, described at the start of the case, kept rearing its head. McCombs and his management team knew something was broken. They considered three options. Either a new supplier had to be found, the contract with the existing supplier had to be tightened and renegotiated, or Gnosis had to bring the capability in-house.

For the latter option, Gnosis determined they needed four different types of data sources to be integrated and fed into T&T. Among these were ocean carrier scheduling data that tracked container ships and the cargo loaded on them, US customs data that detailed information about ISF documents (or Importer Security Filing), terminal data to see the status of each container during its stay in port, and satellite provider traffic data to follow a vessel as it traverses the waterways. Each data source had its own provider, and with its own data definitions and data quality standards. Experience had taught Gnosis that data points weren't as clean as promised and sometimes even conflicted for the same container. McCombs' described what his team considered essential in making the build vs buy decision:

Quality: Could we rely on a third party to service us in the way that allows us to make and to meet guarantees made to our customers?

Continuity: We need a supplier that can grow with us and continue to provide the same level of service at acceptable prices as we grow or as they take on more and more customers.

Over-reliance. How do we avoid having a supplier for data that is absolutely essential for our business success but over whom we have little or no power or influence?

10 Conclusion

Gnosis was a growing player in the international container visibility industry. Recent growth was attributable to epidemic-related disruptions and skyrocketing cost increases experienced in the broader freight shipping industry.⁴ Both pain points had drawn the sharp attention of potential customers' financial executives looking to control transportation and logistics costs. To leverage this disruption, Gnosis had scaled up quickly. But freight shipping could be a cyclical business. Yes, demand for imported cargo spiked in 2021, accelerated by binge purchasing from home-bound consumers, even as the epidemic sparked labor shortages in terminals, container ships, and trucking companies. The consequences were container shortages, logjams in ports and terminals, inefficient use of ship and truck capacity, inventory outages, increases in transportation and logistics costs, and inflation. But McCombs recognized that demand would inevitably fall, the logjams would evaporate, and shipping costs decline. In just the past two months, he had seen the back-up of container ships queued up to enter the neighboring Port of Charleston decline from 30+ to a more normal two or three ships. The recent lockdown of the city of Shanghai might have, if only temporarily, further diminished freight traffic.

McCombs and his team faced three important challenges:

The first was how to grow Gnosis Freight's business. What environmental factors might help shape these decisions? What additional features, products, and human resources might they consider? And what role, if any, would LCNC play in those plans?

The second challenge, and more under the purview of Gnosis Companies, Gnosis' parent company, was what industry to tackle next, guided by their philosophy of business transformation via low-code, data science, and machine-learning tools. Should they, for instance, focus resources on early work in banking, an industry McCombs felt was beginning to fall behind in its use of information technology?

⁴ The cost to move a 40 foot container from Shanghai to Los Angeles skyrocketed from \$1,500 in April of 2020 to \$9,700 by July of 2021 (Source: <https://www.bloomberg.com/news/articles/2021-07-15/container-rates-to-u-s-top-10-000-as-shipping-crunch-tightens>)

The third—and far more pressing—challenge was what to do about the data integration supplier problem McCombs described in the case introduction. What alternatives should they consider and what should the decision criteria be?

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Appendix A: Gnosis Freight Automation Suite

ISF Filing: Automated ISF filing with the extended ability to allow vendors to transmit their respective information directly to the system to allow for automated, paperless ISF filing and status monitoring.

Email Management: Scan, interpret, and route emails sent to centralized email inboxes to the responsible party within the company. Can also be used to automatically store documents transmitted via email (ex. arrival notices, invoices, etc.)

Set Alarms: Customize your homepage and email Gnotifications to include alarms for detention, demurrage, and extended chassis usage, extended vessel delays and other exceptions in your supply chain. Manage by exception and let our technology do the monotonous work for you!

Systems Integration: Integrate directly with existing ERP / inventory management systems to streamline the supply chain. Feed freight-related billing items directly into accounting systems such as NetSuite, Quickbooks, etc.

Cost Optimization: Use the power of machine learning and complex optimization algorithms to reduce costs in your organization; set objectives for minimized costs and maximized revenue and let artificial intelligence handle the most difficult of problems.

Smart Forecasting: Use SKU-level data around your containers and the Gnosis Freight Platform's advanced analytics to link your supply chain and inventory together.

Drop and Hook Automation: Use Gnosis' hierarchical algorithm and automated matchbacks to prioritize hot inbound shipments while simultaneously minimizing detention, demurrage, and extended chassis usage.

Appendix B: Container Shipping Glossary

Beneficial Cargo Owner: A registered shipper or importer who is the intended recipient of the cargo; the party that ultimately owns the product being shipped.

Bill of Lading (B/L): A legal contract of carriage for cargo. It contains details of the shipment, dates, parties involved, etc. The word "lading" means "loading"; "lading" specifically refers to the loading of cargo aboard a ship. There is MBL and HBL.

Carrier: The primary freight transport provider (e.g., Maersk, Evergreen, Burlington Northern).

Chassis: The wheeled undercarriage that a container is attached to when it is to be pulled by a truck.

Container ID: Eleven characters, including a check digit, that uniquely identifies a container and, in its first three characters, the container's owner or principal operator, and in the fourth, the type of container. As containers are reused, their ID cannot be used to uniquely identify a particular shipment.

Demurrage: A penalty fee assessed when cargo is not loaded or unloaded within a time previously agreed to. For instance, when a truck is delayed in picking up a container at the terminal. Fees generally increase over time.

Detention: A fee imposed on an importer when an empty container is not returned by a previously agreed upon time.

Drayage: Drayage describes the transport of containers from an ocean port to a destination. It also describes the process of transporting a container over short distances.

ERP: Enterprise resource planning is software used in managing a company's supply chain, operations, financials, commerce, reporting, human resources, and manufacturing activities.

Freight Forwarder: A company that manages shipments for another firm by contracting with one or more carriers to arrange for goods to be transported from a source (e.g., manufacturer, producer) to a final point of distribution.

House Bill of Lading (HBL): Document that formally acknowledges the receipt of goods being shipped. The House Bill of Lading is issued by the NVOCC to the actual customer. As soon as the NVOCC receives the shipment from the shipper and ensures that all customs paperwork is completed, it releases the House Bill of Lading to the shipper.

ISF Filing: A security form required to be completed and submitted 24 hours prior to loading a container on board a ship. Commonly also known as 10/2 because it requires 10 pieces of information and 2 accompanying documents.

Master Bill of Lading (MBL): A contract issued by a carrier to the shipper or freight forwarder that confirms the receipt of goods and lists all the cargo within a given shipment. Such cargo may be distributed across many containers. MBL is also known as the Ocean or Carrier Bill of Lading.

Master Bill of Lading Identifier (MBL ID): A fixed-length numeric identifier consisting of sixteen digits and a check digit. The first seven digits identify the company and the next nine is a unique serial number assigned by the shipper.

Port: A city or place where ships can load or unload at one or more wharves or terminals. A harbor.

Post Panamax: Container ships exceeding the capacity of the Panama canal's limit of 14,000 TEU.

Shipper: Also known as the BCO. A company (e.g., Walmart) or individual that is the owner and intended recipient (e.g., an importer) or source (e.g., an exporter) of the shipped cargo.

Shipping container: A lockable steel box, usually twenty or forty feet in length, eight feet wide, and eight and one-half high. Some containers have refrigeration capabilities or have been modified to carry other goods.

Terminal: A facility in a port with the equipment and space necessary to load and unload ships and to transfer cargo to trucks and/or rail. Channel depth, bridge clearances, access to rail, and land availability are among the factors that constrain a terminal's capacity and the size of the container ships a terminal can accommodate.

TEU: Twenty foot equivalent units. A measure of container ship capacity. For instance, the Ever Given, the ship that got stuck in the Suez Canal in March of 2021, has a capacity of 20,124 TEU, meaning it can hold a maximum 20,124 twenty foot shipping containers or 10,062 forty foot containers.

VOCC: Vessel Operating Common Carrier. The owner of the container ship (e.g., Maersk, COSCO, APL, Evergreen). In contrast, NVOCC are non-vessel operating common carriers.

Wharf: A level surface extending over water where a ship can dock for unloading and loading freight or passengers. Also called “dock” or “pier.”

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