Ship Angel Whitepaper: Building Real-World AI to Solve a Global Supply Chain Problem
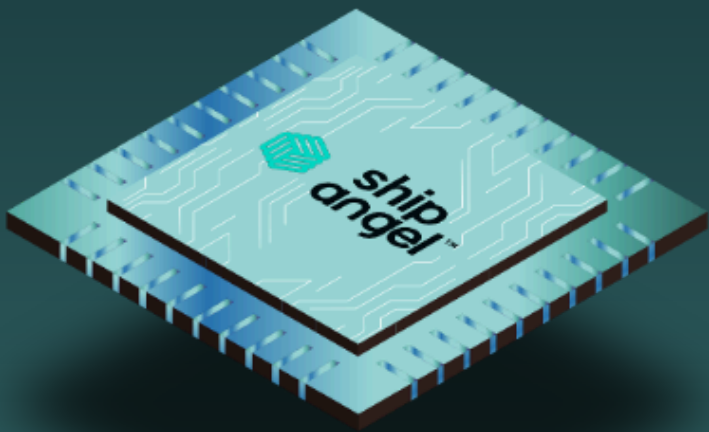
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Container Shipping

A History of Container Shipping

Malcom McLean's shipping container revolutionized global trade and is often considered **one of the greatest inventions of the 20th century.** In 1956, McLean introduced the standardized container, which allowed goods to be packed, transported, and unloaded efficiently. This innovation laid the groundwork for today's shipping industry, streamlining logistics and reducing the cost and time involved in moving goods worldwide.

The global adoption of shipping containers accelerated in the 1960s and 1970s. During that time, the use of containers became widespread, particularly in key trade routes between North America, Europe, and Asia.

The rapid expansion of container shipping during these decades correlated directly with the sharp rise in global GDP.

Global GDP 1950 - 2020 (*The World Bank*)

GDP (Trillion USD)
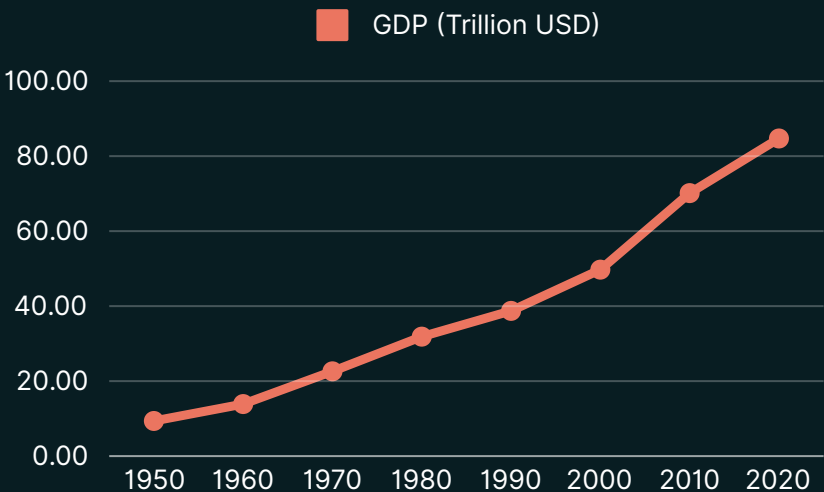
Container Shipping

As containerization fostered faster and more cost-effective trade, it helped fuel globalization and economic growth, enabling countries to **export and import goods with greater ease.** This era saw global trade volumes grow exponentially.

Hong Kong emerged as a crucial hub in global trade during this period, mainly due to its geographic position and advanced port facilities. As a gateway between East and West, Hong Kong benefited immensely from containerization and became a pivotal point for trade in Asia. By capitalizing on its infrastructure and favorable business environment, Hong Kong established itself as one of the world's busiest ports, serving as a key link in the global supply chain.

By the 1980s, shipping from Hong Kong to Europe or the United States cost, on average, around $2,000 for a 20-foot container. Despite this price, **the shipping industry was relatively straightforward compared to modern times.** There were fewer surcharges, and rates only fluctuated once every quarter, making it easier for businesses to predict shipping costs. The simplified nature of shipping rates allowed for better planning and cost management, further encouraging international trade growth.
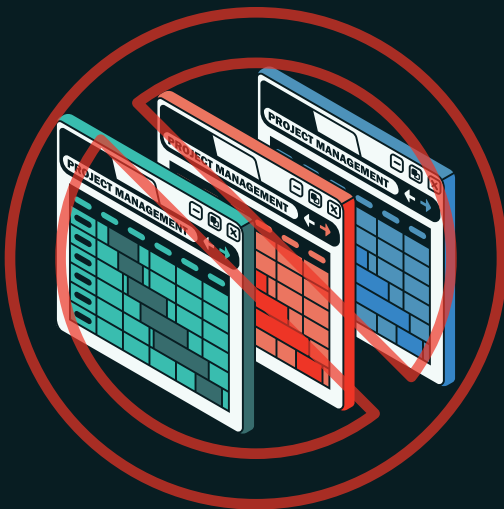
Container Shipping

The Dawn of Freight Technology

Beginning in 2000, **the expansion of freight technologies revolutionized the way shipping rates were managed.** As international trade grew, shipping companies and freight forwarders began to leverage digital platforms to streamline the management of complex rate structures.

Meanwhile, the emergence of rate management companies allowed businesses to handle many pricing models from carriers more efficiently. These platforms aimed to standardize and simplify the intricate web of shipping rates. Still, challenges remained as **each carrier and forwarder maintained their own rate formats, creating inconsistency across the industry.**

One of the major challenges that existed during this time and persists today was the lack of uniformity in rate formats. Each shipping carrier and freight forwarder used their own unique templates via spreadsheets and methodologies for quoting rates, making it difficult to integrate and compare them across platforms.

Container Shipping

Spreadsheets: An Outdated Solution

Spreadsheets have always played a significant role in managing rates. Even today, many shippers continue to manage the rate process with spreadsheets. However, **relying on spreadsheets introduces additional complex layers that absorb considerable time and resources.** Logistics professionals often spend hours managing, updating, and verifying multiple versions of spreadsheets instead of focusing on strategic initiatives.

This creates a bottleneck, as professionals must dedicate significant effort to administrative tasks, slowing down decision-making and response times. Over time, this method of rate management **hampers productivity, making it difficult for companies to scale efficiently** and diverting attention away from more impactful activities like optimizing supply chains, improving carrier relationships, or analyzing cost-saving opportunities.

To overcome this hurdle, rate management companies had to develop systems to handle these variations, but full standardization remained elusive. This lack of consistency added a layer of complexity for businesses trying to compare and optimize their logistics costs across multiple carriers, resulting in **significant time being diverted to administrative tasks instead of focusing on high-value work that drives business goals.**

Container Shipping

To address the issue of rate transformation, much of the manual labor involved in converting and standardizing rates was outsourced to Business Process Outsourcing (BPO) centers. These BPO centers, located in countries with lower labor costs, like India and the Philippines, became critical in transforming shipping rate sheets. Companies would send raw rate data to these centers, which would be processed, formatted into a standardized spreadsheet, and uploaded to the rate management platforms. This model provided a cost-effective way for companies to handle the extensive and labor-intensive task of rate management.

Interestingly, even today, **more than 90% of these BPO centers continue to operate, and many have grown since their inception in the early 2000s**. Despite technological advances like automation and artificial intelligence (AI), most ocean rate transformations are still performed in these offshore centers. The reliance on these BPO centers as the de facto solution for managing and transforming shipping rates has persisted, demonstrating their enduring role in global logistics management. While there is potential for future innovations to replace or enhance this model, BPO centers remain a cornerstone of rate transformation in the shipping industry.

Why AI Can Solve This Complex Problem

The AI Awareness Stage

The time is ripe for solving the rate extraction problem with AI due to the maturity of organizational awareness and technological advancements in AI.

As companies increasingly explore AI, many are in what _Gartner_ calls the "_AI awareness stage._" At this stage, AI is being actively discussed within organizations, but **tangible AI projects are not yet being implemented due to uncertainties.** The primary obstacles include the complexity of integrating AI into existing processes, concerns about technology infrastructure, unclear project timelines, and the lack of solid historical cost-benefit data to justify such projects. These challenges often prevent businesses from launching AI initiatives or lead to projects being abandoned before they reach fruition.

This creates a prime opportunity for offering AI-based tools, like **Ship Angel's Rate Management Technology (RMT)**, as a service. By providing ready-made AI solutions, **companies can benefit from AI without investing heavily in new infrastructure, designing custom solutions, or hiring specialized AI talent.** Pre-built AI tools simplify adoption by removing the uncertainty around cost and timelines, allowing organizations to see immediate benefits. This "_AI-as-a-service_" model will enable companies to use AI without the traditional risks and complexities associated with in-house AI development.

Why AI Can Solve This Complex Problem

AI in Practice: Today's Landscape

From a technological standpoint, while complete AI-based rate extraction systems are still rare, **the current state of AI technology provides all the building blocks needed to solve the rate extraction problem** from semi-structured documents. Rate extraction requires both sophisticated hardware and advanced software solutions to handle the vast and complex data involved.

Cutting-Edge AI Technology

Advanced Software

Sophisticated Hardware
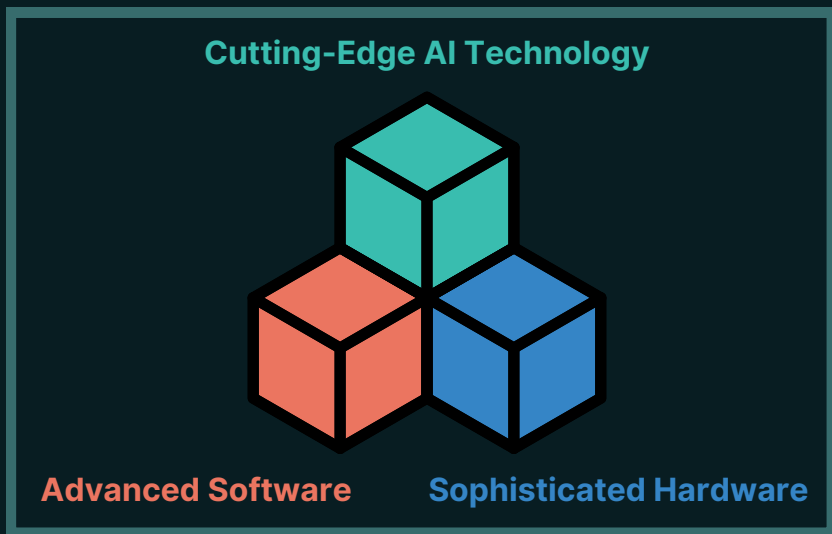
Efficient computing power is critical for processing large amounts of data quickly, while ample memory is essential for running cross-checks and verifications to ensure data integrity. These technological capabilities have matured, providing a solid foundation for AI to tackle complex logistics challenges like rate extraction.

Why AI Can Solve This Complex Problem

Modern AI eco-systems provide the following:

The cloud allows for the continuous comparison of large amounts of data.

Advanced AI frameworks to provide the tools necessary for training, validation, and fine-tuning AI models.

Computer vision algorithms are crucial for recognizing structures in semi-structured documents like PDFs and scanned rate sheets. These algorithms allow AI to identify and interpret data patterns, making it possible to automate the extraction of rate information that would otherwise require manual input.

The availability of general-purpose large language model (LLM) weights provides a tool for processing the often complex conditions and terms embedded within rate sheets.

Domain-specific vocabularies and frameworks allow AI systems to extract entities and terms unique to rate contracts and logistics. By leveraging strong vocabularies, AI can ensure that the extracted rates are accurate and reflective of the specific conditions outlined in the documents.

# Why AI Can Solve This Complex Problem

The combination of both organizational and technological AI maturity means that clients today possess sufficient historical data, which is vital for training and fine-tuning AI models. With access to historical shipping conditions and rates, **AI can be customized and optimized for individual business needs.** This historical data provides the foundation for creating AI solutions that are not only accurate but also highly tailored, ensuring that businesses can get the most out of AI for rate extraction.

Our Approach

Challenges of Traditional Rate Management

Extracting data from rate sheets presents a unique challenge due to the wide variety of information that can appear in these documents. Rate sheets often contain repetitive entries, incomplete data points, and information that must be cross-referenced with external sources. These factors, combined with inconsistencies across different carriers or forwarders, **complicate the extraction process.**

Traditional rate management:
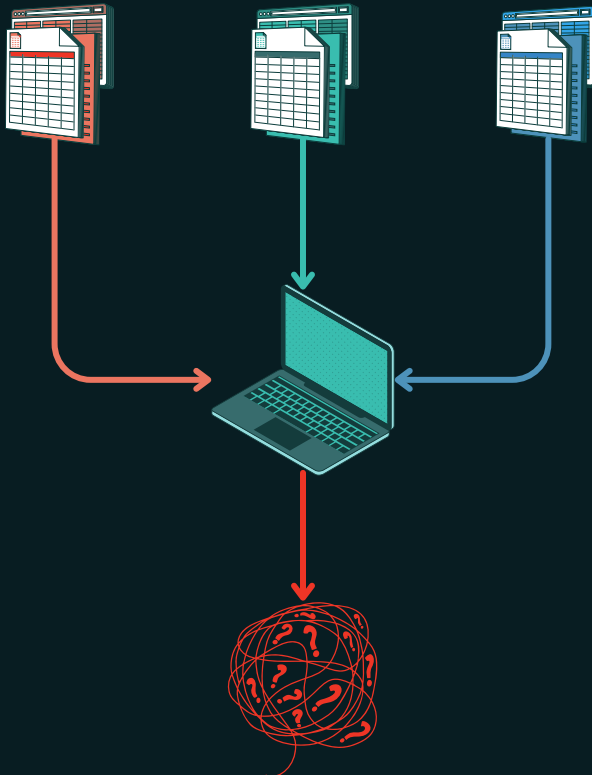
Our Approach

Unveiling Ship Angel's Agile AI Solution

Furthermore, **rate sheets are subject to frequent updates**, making it essential for any system managing this data to quickly incorporate new values while maintaining accuracy. Despite this complexity, **invoices generated from rate contracts must be deterministic**, providing a single, precise amount owed. This requirement necessitates an AI solution that can "understand" the underlying conditions of the rate sheet and generate a logically consistent outcome.

To address the volatility of rate sheets and their ever-changing conditions, our approach is built on a flexible AI framework that can **accommodate immediate needs while preparing for future shifts.** First, we extract a list of the most common data types typically found in rate sheets—such as rates for different container sizes, shipping routes, surcharges, validity dates, and detention/demurrage terms. We then classify other conditions or values that may require further review, ensuring that even less frequent or unusual terms are accounted for. This multi-layered process allows the AI system to **extract essential data while leaving room for human intervention where necessary.**

Our AI solution leverages bespoke models tailored to different types of rate information, **enabling the system to accurately handle the wide variety of data found in rate sheets.** For example, a specific model may be optimized to extract surcharges, while another focuses on shipping routes and container types. Once the data has been extracted, optimization models work to reconstruct the information into a coherent rate representation. This step ensures that all relevant data points—no matter how fragmented they appear in the original document—are integrated into a single, usable format. Consistency checks are embedded throughout the process, ensuring that extracted data is complete, logical, and free from contradictions.

Our Approach

Ensuring Data Integrity

The verification framework plays a crucial role in maintaining the quality of extracted data. **Separate verification models are employed to highlight areas where errors or ambiguities may arise**, such as discrepancies in names or rate values, incomplete entries, or conflicting data points. These models flag potential issues before the data is finalized, allowing for corrections or clarifications. Additionally, the system can identify errors such as typos or misclassifications, providing an extra layer of validation to ensure accuracy.

For cases where the AI cannot resolve ambiguities through probability methods, a human-in-the-loop (HITL) process is utilized. In this approach, human experts are brought in to address ambiguous data points, such as unclear terms or complex conditions that the AI may struggle to interpret. This hybrid method not only **ensures that the final data is accurate but also feeds valuable information back into the system.** As humans clarify ambiguous data, the AI models are retrained with this new information, **continually refining their accuracy and ability to handle future ambiguities more effectively.**

This approach offers a dynamic balance between automation and human oversight, allowing the AI system to **improve over time while maintaining high standards of accuracy.** By blending AI and human intervention, we ensure that rate extraction remains reliable even as rate sheets grow increasingly complex. The HITL process also provides a way to handle the edge cases that may fall outside the scope of automated models, while ensuring that the AI solution continues to evolve based on real-world inputs.

Our Approach

Ultimately, our solution's flexibility in handling a diverse range of rate sheet conditions, combined with its robust verification and refinement processes, **enables businesses to manage their shipping rates more efficiently and accurately.** As the system continues to learn and adapt, it provides both immediate value and long-term scalability, positioning it as a critical tool for solving the rate extraction problem in the shipping industry. By automating the extraction of complex data and providing a consistent, deterministic output, **we help companies streamline their logistics operations while minimizing errors and inconsistencies.**

Ship Angel AI Process:
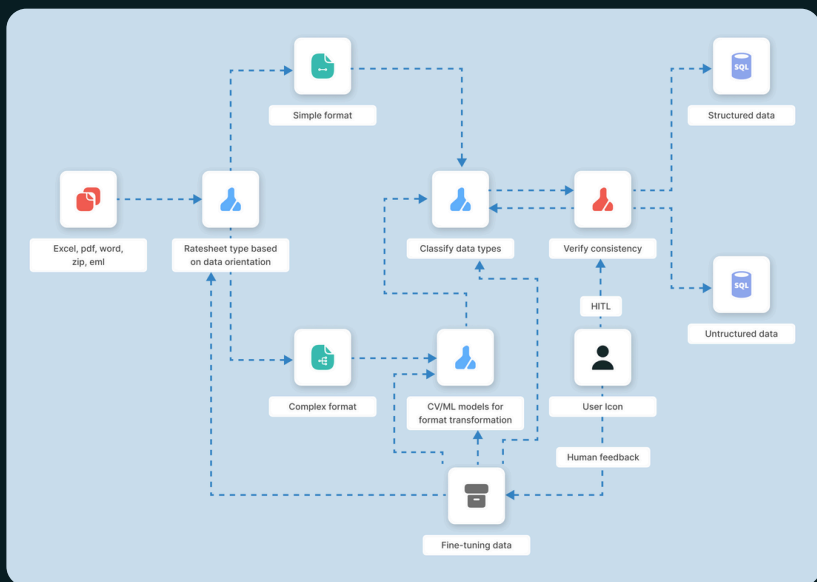
Making Customers' Lives Easier

Instead of navigating through countless spreadsheets and emails to manage shipping rates, **customers can now access a single source of truth** through an AI-powered platform that centralizes all their rates. This shift significantly streamlines the rate management process, offering users a **clear and consolidated view of all the data they need in one place.** AI-enabled platforms can aggregate rates from different carriers and forwarders, regardless of format or complexity, and present them in an organized, easy-to-access manner. This kind of solution eliminates the delays typically associated with manual processing through BPO centers, offering real-time updates and insights that empower businesses to make faster, more informed decisions.

How AI Helps The Shipping Industry

Unprecedented Speed: The New Norm

The speed of AI processing is a game changer for the shipping industry, as it reduces the time it takes to extract, validate, and organize rate sheets. What once took days or weeks with BPO centers, involving back-and-forth communications, manual data entry, and validation, **can now be accomplished in a fraction of the time.**

Companies no longer have to wait for manual transformations and spreadsheet updates to understand their shipping costs, meaning they can respond to market changes faster, secure better rates, and improve their operational efficiency. The real-time nature of this technology gives businesses a competitive edge by **enabling them to be more agile and responsive.**

How AI Helps The Shipping Industry

Eliminating Errors in a New Era of Accuracy

Beyond the time savings, AI-powered rate platforms **significantly reduce the risk of manual errors**, which are common when rate sheets are processed through traditional methods. Human data entry is prone to mistakes, especially when dealing with complex shipping rates that may vary by container size, route, surcharges, and conditions. These errors can be costly, leading to inaccurate invoices, missed surcharges, or the application of incorrect rates. By automating the extraction and validation of rate data, AI ensures that **companies can trust the numbers they're seeing**, reducing disputes and discrepancies while improving cost accuracy.

This kind of AI solution could revolutionize not just individual businesses but the entire shipping and logistics industry. With AI, the industry can standardize rate management, **allowing carriers, forwarders, and shippers to operate more cohesively.** This would enable more seamless rate comparisons, better visibility into pricing, and a more transparent logistics ecosystem. By removing the bottlenecks associated with manual rate processing, AI has the potential to drive greater efficiency across the entire supply chain.

The use of AI in rate management could also foster better relationships between companies and their shipping partners. With fewer errors and more transparent rate handling, **disputes over costs and surcharges would diminish.** This would improve trust between shippers, forwarders, and carriers, leading to smoother business transactions and more collaborative partnerships. AI-driven transparency could even push the industry toward more standardized rate formats, further simplifying the rate management process for everyone involved.

Conclusion

Ultimately, adopting AI to manage shipping rates offers a huge opportunity to modernize a key aspect of global trade. It not only saves time and cuts costs for individual companies but also enhances accuracy, reduces errors, and **brings a much-needed level of efficiency to the entire logistics industry.** As AI continues to mature, it will become a standard tool for companies of all sizes to optimize their shipping operations, driving innovation and growth in global trade. The ability to access **a single source of truth for shipping rates** will transform how the industry operates, pushing it toward a more connected, agile, and transparent future.

About Ship Angel

Ship Angel is a cutting-edge rate management platform designed to streamline logistics operations for BCO shippers. Focused on solving complex supply chain challenges, Ship Angel provides innovative solutions for rate management, amendment guard, invoice auditing, and sustainability reporting. At the heart of Ship Angel is its **AI-driven technology**, which empowers shippers to manage rates more efficiently, ensure contract accuracy, and optimize cost savings. With a commitment to transparency and efficiency, Ship Angel's platform **helps companies avoid costly delays and disruptions**, making it an invaluable tool for managing the modern supply chain. Driven by a vision to revolutionize logistics, Ship Angel works closely with clients across various industries. By offering personalized support and advanced tools, Ship Angel helps companies stay ahead in an ever-evolving global trade environment.
For more information, visit shipangel.com

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