» Guide

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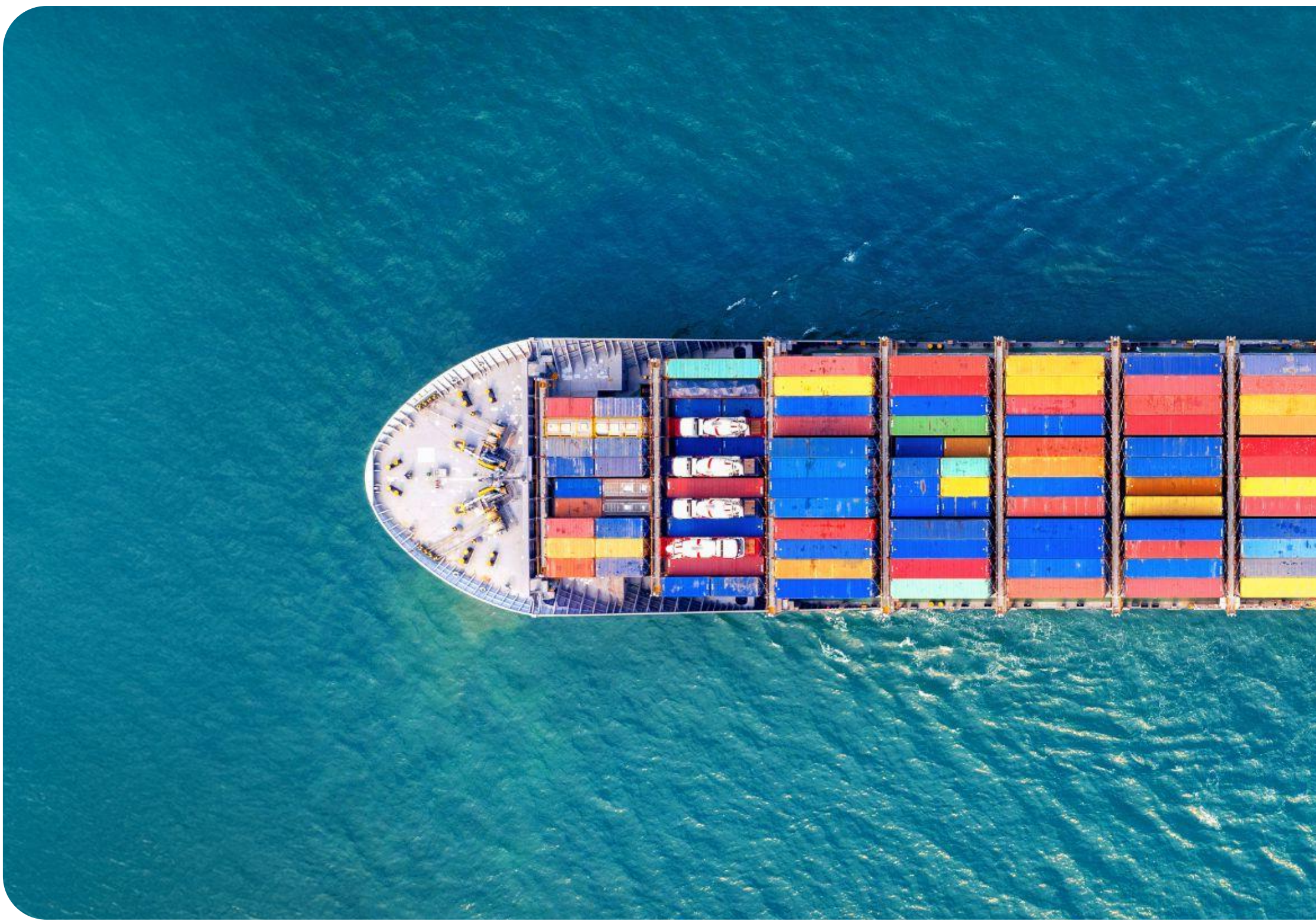
How to build a custom TMS the Rappit way

The Rappit approach to building mission critical solutions for transportation and logistics providers



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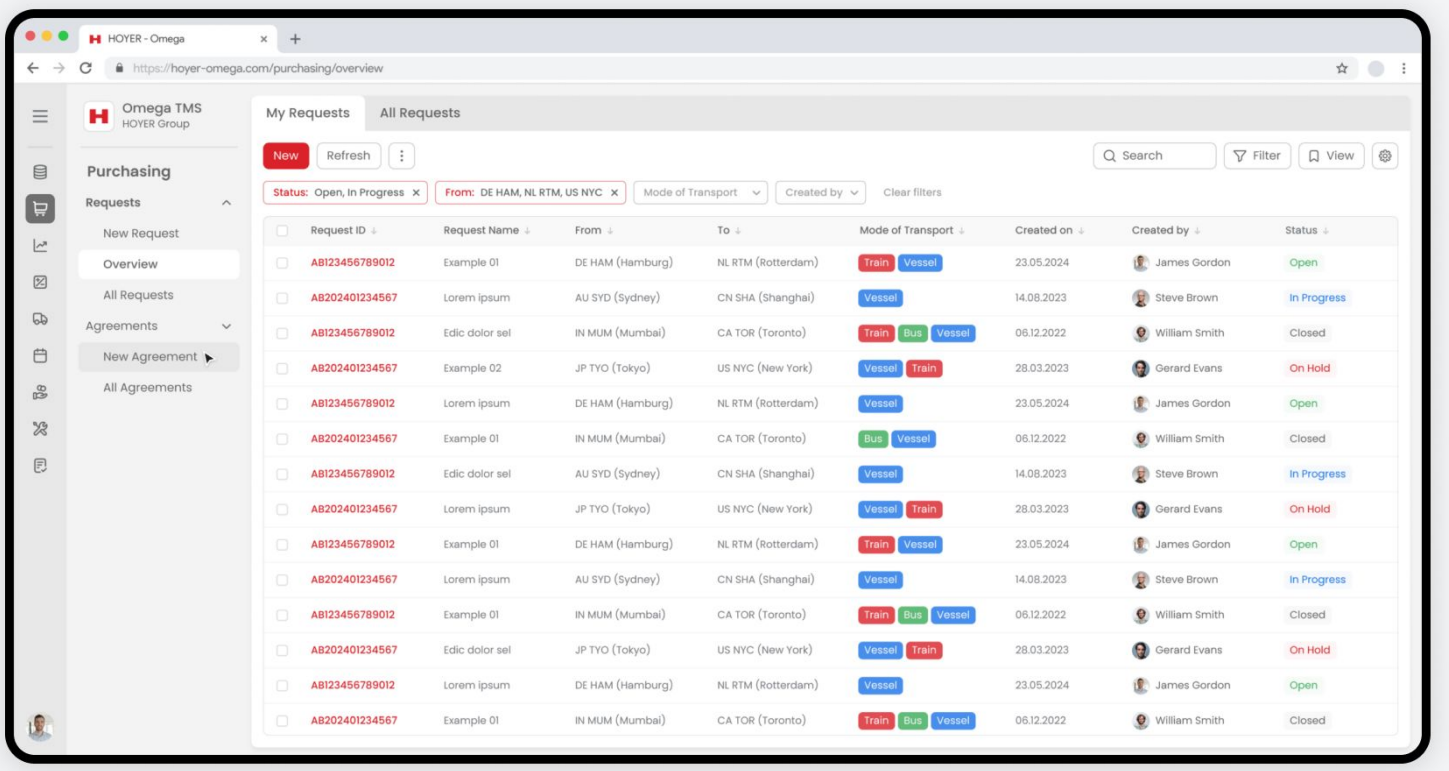
Chapter 1

Introduction

TMS: a mission-critical solution for transportation and logistics providers

Companies in the transportation sector run on thin profit margins. Surviving in that environment requires operational excellence. As a result, businesses in the sector rely heavily on information systems such as Transportation Management Systems (TMS) that enable more effective and efficient logistics management. Having the right TMS allows businesses to optimize transportation networks by automating, integrating, and streamlining end-to-end supply chain operations.

Out-of-the-box TMS solutions offer a host of basic functionality that may seem to cover everything a company would need to achieve their goals. However, diving deeper into the details of what a company does often reveals a unique characteristic or specialized capability that differentiates it from the competition. When selecting a TMS, it's vital that companies select a solution that supports their unique capabilities or enables differentiating capabilities to be easily added.



However, most off-the-shelf TMS solutions do not allow advanced customization and may not include all the required basic functionalities. This can result in a business having to adapt its processes to the TMS, instead of the TMS adapting to the business. This will not only slow down implementation but may also eliminate an existing competitive advantage and hamper future agility.

Chapter 2

Typical TMS components

TMS is a label used for a broad range of systems that support transportation operations. There is much diversity in types of TMS. Dimensions such as scope, region, modality, and type of goods determine the nature and applicability of a certain TMS. Some TMS solutions support only one modality, others support multiple. Certain types of freight, like Cold Chain Transport, Containers, and Bulk require specific business logic and integrations.

Often, an off-the-shelf TMS is only optimized for a limited set of use cases. Therefore, businesses should carefully explore the scope and features of a TMS to see whether that system is a realistic option for their business. While there are huge differences in scope between various TMS solutions, a typical TMS contains a subset of the following primary functionalities. Some of the larger systems might cover them all:

- Master Data
- Fleet and Asset Management
- Maintenance and Repair
- Products (bulk transportation)
- Load optimization
- Transport execution
- Finance and Billing
- Carrier Selection
- Quote and Contract Management
- Freight settlement and auditing
- Route Planning and Optimization

In addition to the primary functionalities, there might be supporting functionalities and capabilities such as these:

- **User Management**
- **Customization options**
- **Workflow management**
- **Business rules**
- **Data Analytics and Reporting capabilities**
- **AI-driven user guidance with recommendations**
- **Integration capabilities**
- **Bulk upload and update features**
- **Document management and document recognition capabilities**
- **Connectivity with IoT tracking devices and board computers** (realtime tracking)
- **Communication channels with support for EDI**

This list is not exhaustive but gives an indication of what can be in scope for a typical TMS solution.

Chapter 3

When to consider a new TMS

Today, flexibility is a fundamental requirement for a core system. It allows a business to stay competitive by continuously aligning with new market opportunities and business models, as well as new requirements around compliance and documentation. Many businesses in the transportation industry, however, are hindered by inflexible legacy systems that have monolithic architectures and run on older technologies. These systems lack real-time visibility and have limited integration capabilities. They are difficult to extend with features for new innovations like big data and analytics.

Many legacy systems rely on a generic, data-centric user interface that is not designed with the user in mind or optimized for the job at hand. Users have to perform a lot of unnecessary clicks to achieve their objectives. This increases the risk of error and delay and often causes employee and customer dissatisfaction. Younger employees in particular are accustomed to the modern, user-friendly, task-driven user interfaces of their personal devices. They increasingly expect a high level of usability from the systems they work with.

In addition, on-premise legacy TMS solutions with monolithic architectures are not designed for a cloud environment and prevent an organization from maximally benefiting from cloud-native capabilities. Unlike most legacy systems, a cloud-based infrastructure can easily scale up and down with the application load and provides the ideal foundation for integrating AI and other modern technical innovations. The cloud removes many of the barriers to adopting new technologies, making it more affordable, efficient, and less resource-intensive to do so.
API-based integration with data analytics tools, for example, makes it easy for companies to take advantage of data-driven decision-making.

Companies that choose cloud-native modernization will be rewarded with a robust but flexible architecture that enables seamless, event-based automation, and easily exposes TMS functionality to multiple types of devices. This makes it possible, for example, to offer dedicated functionality for mobile phones. This gives employees, partners, and customers real-time access to up-to-date information and facilitates real-time interactions, enabling faster decision-making, simplified tasks, and a better experience for all stakeholders.

There are countless ways in which cloud-native TMS solutions improve agility and boost operational excellence while lowering costs. Companies that are hemmed in by legacy systems and unable to take advantage of the latest innovations may want to consider modernizing to ensure they can continue to thrive in the uncertainty of today's business climate.

Chapter 4

The solution: off-the-shelf or custom?

Implementing a new core system is a serious undertaking that requires the right preparation. First, you'll need to analyze your business requirements and achieve a shared understanding of what makes the business unique and competitive. Research should then be done to determine whether there is a standard off-the-shelf solution that can sufficiently address these unique needs. Next, a thorough cost-benefit analysis must be done in which budget and time constraints are taken into consideration. For more background on this, see an earlier Rappit blog on TMS: standard vs. custom.

The outcome of this exercise may well be that a truly differentiating and future-ready TMS must be custom developed. In this case, you may want to consider engaging with a software vendor to develop the new system. This allows your company to stay focused on the "what" (the needs and strategy of your core business) while subcontracting the "how" (execution of the "what") to a specialized partner. A partner that has both technical expertise and relevant domain knowledge will be able to share examples of what they've seen in the field, while introducing you to innovative ideas that have yet to be widely adopted.

Evaluating your options

Analyze business needs
Understand your unique business requirements and competitive advantages.

Explore solutions
Research options and conduct a cost-benefit analysis.

Consider custom development
A custom TMS may be necessary for differentiation.

Engage a partner
partner with an enterprise software provider for expert development.

Chapter 5

The Rappit approach to building a custom TMS

Engaging with Rappit, or any partner, to develop a custom core solution requires collaboration, transparency, and alignment between key stakeholders within your organization and between your organization and the vendor. Rappit has years of experience building custom, cloud-native TMS solutions using the latest technologies. Our solution will support your existing differentiators, enable you to create new ones, and provide all the capabilities your business needs to maximize competitiveness and agility in a rapidly changing global logistics environment. Rappit development teams can work alongside your team or become an integrated part of your team, filling in capability gaps where necessary.

Discovery phase 1

Writing of the requirements for the new system and creating an implementation strategy

Design phase 2

Defining the high-level system architecture

Minimum Viable Product (MVP) phase 3

Development begins with the first module which typically starts by developing an MVP

Develop & deliver phase 4

Rappit's software development methodology ensures a high-quality result

Quality assurance phase 5

Comprehensive testing and a smooth roll-out process

Maintain & adapt phase 6

Ongoing monitoring and maintenance

Chapter 6

The phases of the process

Discovery phase

The first step in Rappit's approach is the Discovery Phase. Our architects and business analysts use an agile and iterative way of working which means that not every detail will be defined at the start, rather, they will be refined throughout the course of the project. This ensures maximum alignment and creates an optimal foundation for a successful implementation.

The team begins by writing requirements for the new system and creating an implementation strategy. The first step is to analyze the application that needs to be replaced or modernized and gain a general understanding of what works well and where the pain points are.

Understanding the scope and structure of the old system will give the team an idea of how to divide the full scope of the project into iterations, and in which iteration(s) the old and new systems will work together. This ensures a more controlled and seamless process that will have less impact on business as usual.

A pitfall to avoid at this stage is to not allow the old system to act as a template for the new. The purpose of analyzing the existing TMS is to capture requirements only, its structure must not limit the team's creativity when imagining the capabilities of the new system. The Rappit team's deep and broad expertise creating modern TMS solutions will help avoid this pitfall.

Key outcomes

During the discovery phase, the following elements should become clear:

Key requirements

What makes the business unique? What is the desired business impact of the new TMS? What is the purpose of the high-level features? Who are the target users? etc.

Scope

Determine objectives and full scope of the solution.

Dependencies

Determine dependencies with other systems. Which integrations are required with other systems in the company or in the supply chain?

Implementation method

Determine options for co-existence of old and new systems to enable a gradual and phased implementation. Determine the high-level implementation approach across the organization.

Trends and regulations

Understand where the industry is headed and make sure corresponding key requirements are taken into consideration in the new system.

High-level effort indication

The high-level features as defined are grouped in complexity buckets. The result is a high-level effort indication that can help determine budget needs and expected timelines.

Design phase

System architecture

Next is the design phase in which we define the high-level system architecture. This describes the road to success and is aimed at reducing risk and uncertainty. The full scope of the project needs to be broken down into components that make sense from a technical or business perspective. Based on this, a plan for developing the components of the high-level architecture can be created.

A key component of the high-level system architecture is the underlying infrastructure. When implementing a TMS, Rappit uses a robust infrastructure that has been proven over many years in many projects. This technical infrastructure runs on Google Cloud Platform (GCP), which is well-known for its reliability and innovation. Rappit is a Premier Partner of Google Cloud Platform and has achieved specializations in “Application Development” and “Infrastructure Services”. When deployed on GCP, the solution can be easily extended with data- and AI-driven solutions for the transport sector provided by Google, such as Google Cloud for Supply Chain and Logistics. As part of the project, Rappit will also ensure all data objects follow uniform standards, creating a strong foundation for data exchange by the system.

Another important element of the system architecture is the integrations. Today, no core system runs in isolation; it is embedded in the internal application landscape and the external supply chain. Rappit has ample experience building connections with 3rd party applications and provides REST APIs on top of the application tables to enable quick, standardized connections with other systems.

“We choose Rappit for their strong domain knowledge building multiple Transportation Management Systems. They have a proven application development platform for building business-critical systems. “

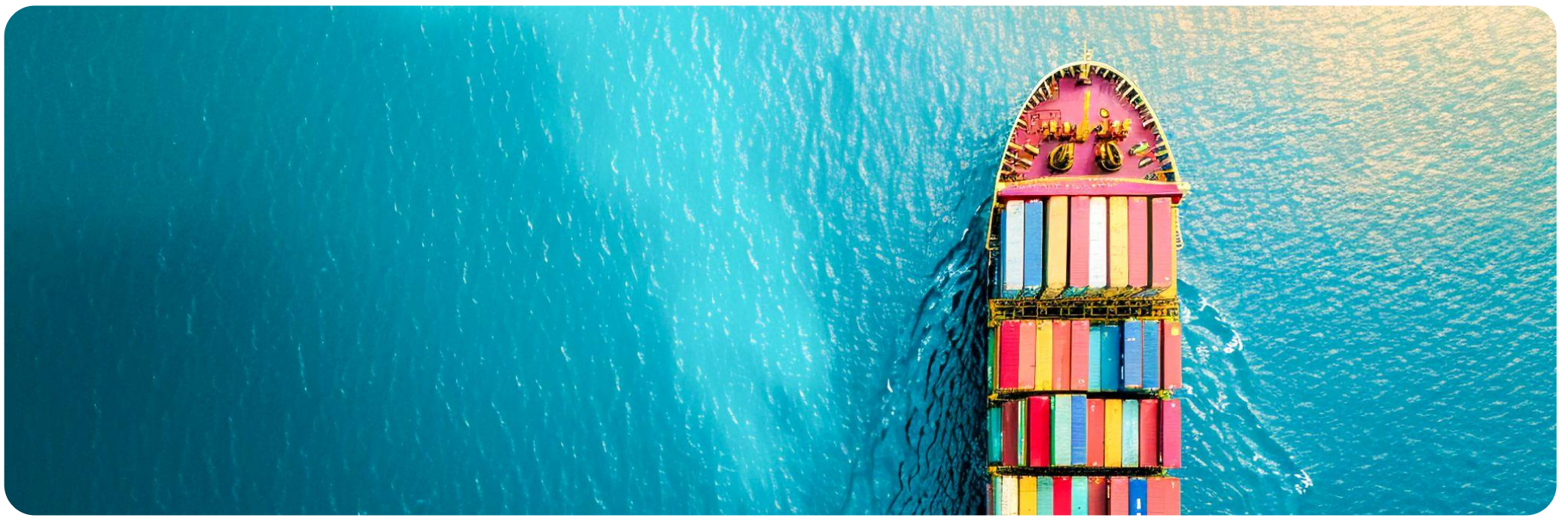
Björn Smidt, Head of Business Systems, HOYER Group

Search, security, and flexibility

The system should also provide fast and intuitive global search capabilities, allowing users to view, sort, search, and filter records efficiently across multiple columns. To ensure smooth performance even with complex queries, Rappit integrates a specialized search layer optimized for web-based searches.

To further optimize the TMS for performance, security, and maintenance, it's vital that the architecture and code are developed in a secure and compliant way according to best practices. Best practices ensure that code is developed securely in the correct layer of the system architecture, and that data maintains its integrity as it moves through the system. Normally, manually enforcing best practices would require significant effort from developers. However, Rappit has encapsulated this knowledge into ready-made tools and frameworks, which it applies to customer projects. This reduces setup time and ensures that the code is always consistently structured and provides built-in data integrity and security.

In the final phase of high-level system design, it is important to identify which aspects of the system require more flexibility than others. Instead of being hardcoded, these areas may have to be supported by a dynamic, model-driven approach to adjusting the business logic, such as a workflow engine or business rules engine. This allows organizations to separate certain types of business logic from the core software code, so changes can be made on the fly without requiring a full system update. This gives the business the control it needs to stay agile in the face of rapidly changing market dynamics.



Minimum Viable Product (MVP) phase

When the high-level architecture design is complete, development begins with the first module. In larger projects, Rappit typically starts by developing an MVP. This initial module is small in scope, but large enough to be put into production. The objective is to showcase what's possible to the project board and provide the business with an early success. During the MVP phase, the teams align more closely, and learnings are used to improve the way of working together when developing subsequent modules.

During the detailed design phase of the MVP and later modules, the user experience is taken very seriously. Rappit's UX experts and developers work alongside the business to quickly gather requirements and create a prototype of the UI, workflow, and related logic, which are all designed from the user's perspective. This makes the system intuitive, visual, workflow-oriented, and focused on getting the job done efficiently. In this phase, the starting point for the design is the task to be done by the user. During the execution of this task, the user will be guided by the system with suggestions and recommendations. If applicable, specific interfaces for mobile can be considered to maximize user efficiency.

Develop & deliver phase

Rappit's application development platform

When the design work is completed, the develop & deliver phase starts. In this phase, Rappit's software development methodology ensures a high-quality result. Rappit uses the Agile Scrum methodology, meaning work is broken into small tasks (backlog) and tackled in short work cycles (sprints). The team organizes and tracks progress using tools like Jira (task tracking), Confluence (documentation), and X-Ray (testing management) to ensure a smooth process.

Rappit has three products that are important enablers for success in this phase and will be leveraged based on the requirements and scope of the project:

rappit developer

application modernization & generation

Rappit Developer streamlines the development process from use case definition to coding. It ensures that requirements are well-structured and provides a visual modeling layer for easy configuration. Developers can also add custom logic without limitations.

The platform enables fast and efficient development by automatically generating complex, architecture-specific code. It supports breaking down applications into smaller, independently deployable components that still share the same database. This is ideal for transactional core systems that rely on database performance and integrity while avoiding the rigidity of a monolithic architecture.

Rappit Developer combines the maintainability of microservices with the stability of a monolith. Applications built with it generate source code using popular open-source frameworks, making them easy to package and deploy in containerized environments like Cloud Run. Additionally, it automates essential development tasks, including generating test scripts, sample data, and release notes.

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Premier Partner
Google Cloud

rappit composer

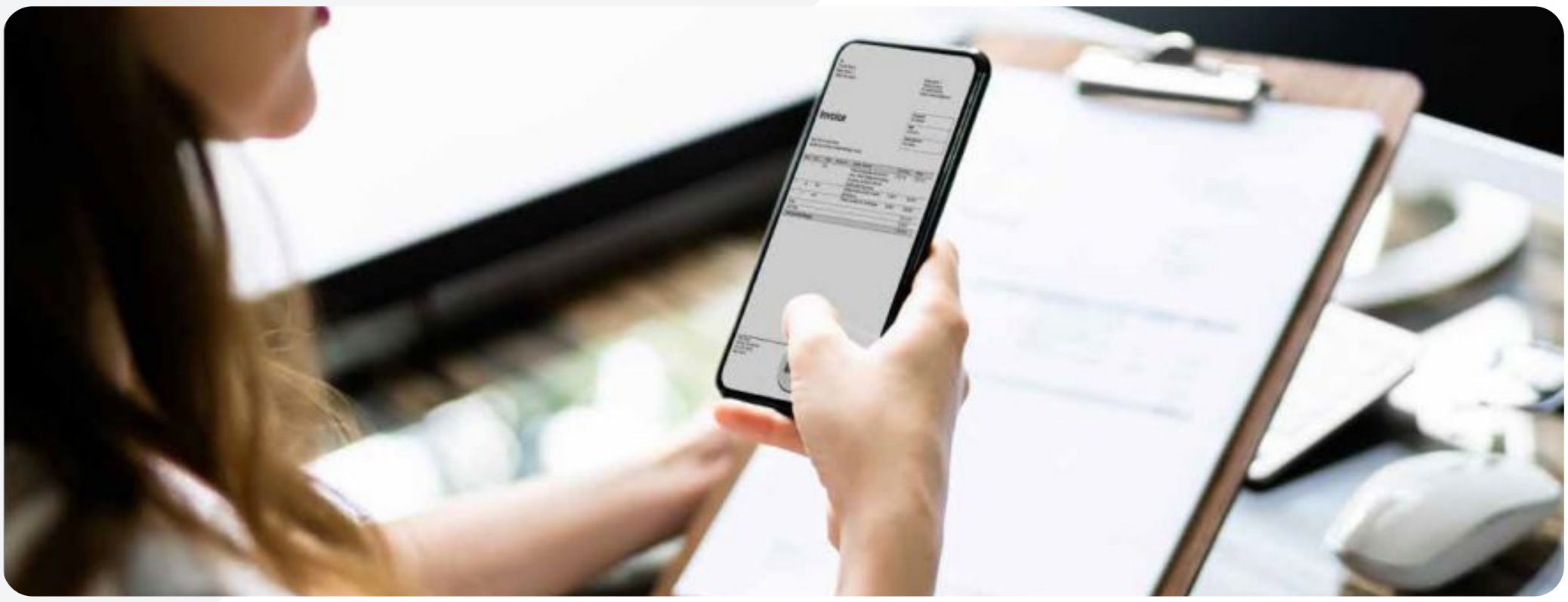
no-code apps & workflows

Rappit Composer provides a model-driven environment for executing dynamic business logic, such as workflows, business rules, and task-driven mobile apps. Dynamic business logic can be modeled in Rappit Composer and maintained by separate business teams decoupled from the software release cycle. This enables flexible adjustments to be made to business logic for tasks that are dependent on things like changing regulatory requirements or complex automated processes.

rappit undoc

automate document processing

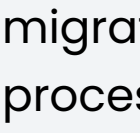
Rappit Undoc is a set of capabilities for intelligent document recognition, bridging the gap between structured data and the unstructured world of documents. Powered by (gen)AI, Rappit Undoc efficiently processes and recognizes diverse document formats. This is very useful in the transportation industry where varied document types are still integral to operations.



Quality assurance phase

An important aspect of the delivery stage is quality assurance. Testing is done on multiple levels at numerous points during the project. The first level of testing is done by the developer on an individual ticket basis. The second level is done by the Rappit technical team for each internal release. Additionally, automated testing and dynamic application security testing is performed in the continuous integration/continuous deployment (CI/CD) pipeline. The third level of testing is done by the user acceptance testing (UAT) team. Typically, the UAT team consists of key business stakeholders, and it is the last quality gate before the new release is deployed to production.

Once the solution is in production, a final check will be performed to confirm that critical features such as logging in and loading data work correctly. If the new system is replacing an old one, data migration scripts will be executed to ensure a smooth transition for users. Depending on the type of engagement it is, either Rappit or the customer will handle these final tasks. If necessary, end-user training will be provided to ensure a smooth roll-out process.



Testing
From developer checks to user acceptance testing, Rappit's comprehensive testing ensures high-quality results.

Final check
Post production checks, data migration, and a smooth roll-out process.

“Rappit has been our key partner. By working very closely with our business and IT team members, they have made our wish come true. The no-nonsense approach, deep technical expertise, and ability to understand the business needs stood out during our collaboration.”

Sjoerd Stiksma CEO, Verhoek Europe

Maintain & adapt phase

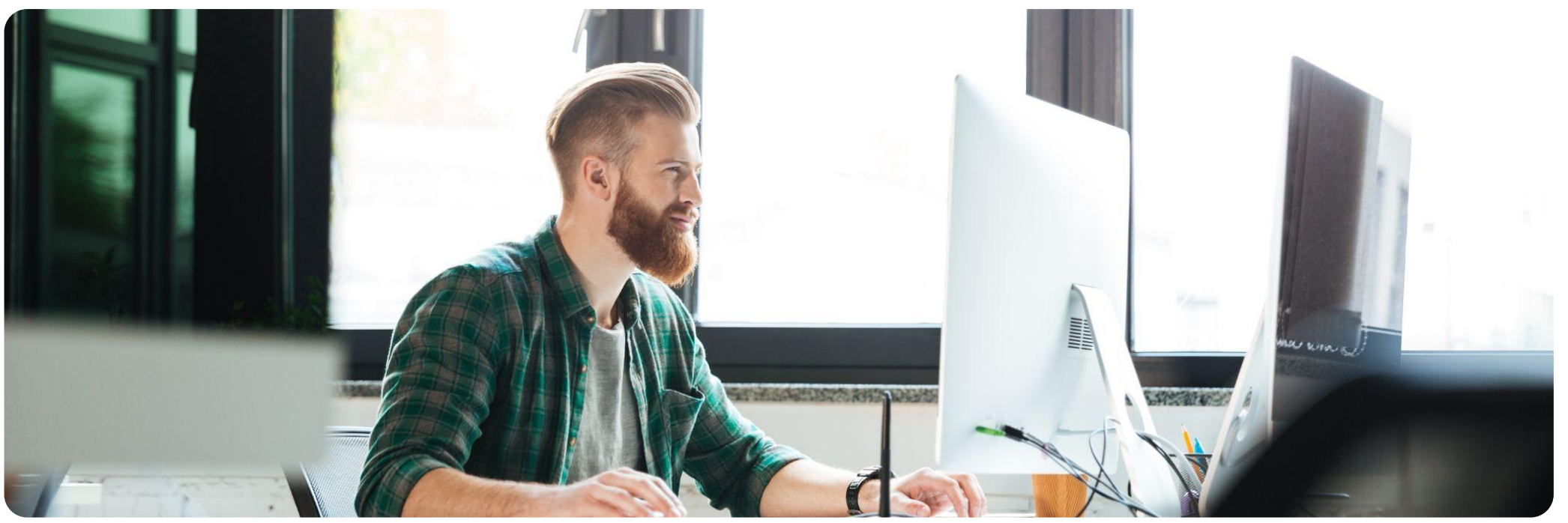
Once the software is successfully implemented, the maintain & adapt phase will start. Ongoing monitoring and maintenance is necessary to ensure continuous availability and security of cloud-based systems. Depending on the type of engagement, this service can be provided by the Rappit Cloud Operations and Support team. All Rappit services are ISO27001-compliant and yearly validated by an authorised certification body.

In addition to this, Rappit can deliver SOC2-assured Cloud Operations and Support services, including a SOC2 type II report. This is particularly interesting for companies that perform work related to critical infrastructure or essential services or otherwise have strict security requirements. In this service model Rappit will continuously perform system-wide control activities to ensure security, availability, confidentiality, processing integrity, and privacy. Periodically, an external auditor will assess the design and operational effectiveness of our controls and confirm its findings in an official SOC2 report.

Our Rappit products will be delivered with SOC2 assurance in Q3 of 2025 when the NIS2 directive comes into effect in Dutch law.

“Rappit is not only a very skillful supplier and developer, but also a very good partner, walking the extra mile and providing world-class services across the world and around the clock. With their help, we have reduced processing time in our sales and operations teams by more than 50%, compared to our old system.”

Michael de Rijk
CEO, NewPort Tank Containers



Chapter 7

Final thoughts

Transportation management software modernization is a complex process that requires careful planning, a phased approach, and effective communication between all parties involved. Working with an experienced software development partner can help you avoid common pitfalls and select the modernization strategy that best suits your business.

Rappit specializes in the development of custom TMS systems. We have over 20 years' experience helping companies in the transportation and logistics industry realize their business goals by leveraging technology more effectively. We understand the risks and rewards that drive your industry and your business, and our experts will work in close collaboration with your team to ensure your project is planned effectively, executed efficiently, and delivered successfully.

The combination of our unique approach, the Rappit Platform (Developer, Composer, Undoc), and our extensive experience building complex software architectures guarantees you a comprehensive TMS solution that delivers:

- A robust, enterprise-ready architecture
- No vendor lock-in
- Better maintainability through separated components
- User- and task-centric UX design
- Phased implementation to minimize business risk
- Runtime configuration options for dynamic processes
- A cost-effective build process

Chapter 8

Real world customer cases

NewPort Tank Containers

NewPort Tank Containers is a leading, global, specialized tank container operator. Rappit helps NewPort to stay an industry leader by creating a tailor-made transport management system (TMS) that is intelligent and futureproof. Rappit's solutions were User-friendly, simplifying complex jobs around quotes, delivery terms, vendors, routes, vessels, locations, lobs/activities, coastlines, documents, milestones, and billing.

Read building a next-level transportation management system.

400+
Users daily

50%
reduced time sales and operations teams

1.5m
transactions per week

Verhoek Europe

Verhoek Europe is an international logistics service provider with fourteen locations across Europe. Rappit supported Verhoek Europe in this project as their trusted implementation partner to replace its outdated Transport Management System (TMS) with a custom solution. Within 2 weeks, Rappit developed an Artificial Intelligence powered module, leveraging Rappit Undoc, to automatically process export & import customs and transport documents. Resulting in an ROI of < 3 months, with 8x faster processing of +100k documents annually.

Read replacing a legacy Transport Management Solution.

>25%
more efficient

<7
man-days required to deliver a Proof of Concept

100%
match with the unique company processes

Take a deeper dive

Is your current TMS keeping pace with your growing demands? Discover how Rappit can modernize your technology and elevate operations to new levels of efficiency. Contact us and take the first step towards a more productive future of transportation management.

Rappit is a leading independent software provider. Building on a proud heritage, we are experts in developing Cloud based Enterprise Software modernization solutions, that include Custom Made Applications, Data Analytics, Artificial Intelligence and Machine Learning. Based on the Rappit Platform, consisting of amongst others Rappit Developer and Rappit Composer, we enable our customers to create unique business value.

Rappit serves a customer base consisting of multinationals and medium-sized organizations, mainly in the Manufacturing, Supply Chain & Logistics, and Retail & Wholesale industries. Our Rappit Platform also supports ISVs and System Integrators in building world-class applications.

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