



Transportation Management System Compass

Navigate to a Transparent
Transportation Market

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Foreword

As our motto for 2020, the German non-profit supply chain association “Bundesvereinigung Logistik” has chosen “Sustainability in Action – Winning the Next Decade”. The numerous challenges facing our global economy call for sustainable and responsible action on the part of all relevant stakeholders. We believe sustainability should be the driving force for all of our actions in at least three dimensions:

Ecological sustainability to secure the basis of all life and avoid damaging our climate.

Social sustainability as a precondition for our shared participation in the global economy.

Economic sustainability as a benchmark for the long-term organization of international trade relationships as well as, from the corporate perspective, a prerequisite for investment in new technologies and therefore for our own future viability.

The logistics sector has always played a key role in connecting different national economies and paving the way for the flexible and reliable exchange of goods worldwide. It is central to economic prosperity and global interconnection. Thanks to new digital technologies, logistics managers all over the world can successfully manage fast-growing transport volumes and ever shorter throughput times as well as responding effectively and swiftly to disruptions in the supply chain. Transport management systems (TMSs) act as a key interface for engineers in the supply chain, giving freight forwarders an efficient and transparent way to monitor their shipments and the digital means to communicate with their partners in the supply chain.

With this study, Deloitte Consulting offers an overview of the market for transport management systems. How are provider and service portfolios structured in each region? Which functionalities and business processes do the TMS models offer? To what extent are more recent developments like robotic process automation featured in TMSs?

I hope that this report makes for stimulating reading and helps you gain new insights and ideas that you can use as you select or design your own TMS. I wish you every success in the organization of your supply chains and invite you to enter into this inspiring dialogue with the members of our network.

Dr. Christian Groteemeier

Managing Director BVL.digital GmbH

BVL.digital is a subsidiary of Bundesvereinigung Logistik





Our perspective on the Transportation Management System (TMS) Market

By the year 2024, global freight volume is forecast to surge from 54.69 billion tons (2015) to 92.1 billion tons.¹ Trends in the transportation market affect this high increase in volume. These trends can be divided into exogenous and endogenous influence factors.

Exogenous influence factors

are external factors that affect a company. These trends can only be influenced by a company to a very limited degree.



Cost pressure

Rising logistics costs – Higher price transparency and price sensitivity



Demand fluctuation

High client demand volatility



Governance regulations/compliance

Laws, regulations, standards



Individualization

Specific customer demand – greater diversity



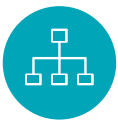
Staff shortages

In the transportation industry



Risk/Interruptions

Political risks, natural disasters, cyber attacks



Complexity

Complex and dynamic market



Sustainability

Higher demand for Go Green initiatives



Changed consumer behavior

Change in distribution of sales channels²

¹ cf. Statista (2019).

² cf. Bundesvereinigung Logistik (2017), P. 18–20.

Endogenous influence factors

are driven by a company rather than by external factors and can be manipulated to favor the company's needs:



Digitization of business processes

Moving from a paper-based to a digitalized process.



Business analytics

Increase the transparency of a value chain with the help of Data analytics.



Transparency in supply chain

Increase transparency in the whole value chain.



Automation

Increase productivity by a higher degree of automation on processes and machines.



Networking/collaboration

Vertical and horizontal connection of the network.



Decentralization

Decentralized warehouse and hub concept.³

Transportation Management Systems (TMSs) are becoming essential tools to meet the challenges associated with these trends, ranging from high growth rates and rising costs to increasingly sophisticated customer demands. We have seen a very diverse TMS market emerge that aims to keep pace with the latest technology trends.

End user drivers of a TMS mainly include improved visibility, increased operational efficiency, greater business process outcomes, and cost sensitivity. These drivers are also reflected in the TMS technology trends.

Visibility can be improved by machine-to-machine (M2M) communication between companies. Therefore, M2M communication has the potential to connect different transport logistics companies via intelligent devices in a cyber-physical way. This Internet of Things (IoT) technology fuels

services such as intelligent transportation, logistics and supply chain management, onboard security, traffic and infrastructure management, fleet management, and route planning.⁴

Increased operational efficiency can be achieved by localization technology, such as radio-frequency identification. Localization technology helps to manage the whole transportation chain in an efficient way, by enabling the seamless tracking of vehicles and improving operating costs significantly compared to containers and freight stations. In addition, predictive analytics support operational efficiency by using internal and external data to improve, for example, the demand forecast and act in proactive rather than reactive ways. Automation and robotics/artificial intelligence (AI) offer an opportunity to improve operational processes via, for example, automated hubs and gateways that interact with a TMS.

All this is underlined by cloud technologies, such as Platform as a Service (PaaS) and Software as a Service (SaaS). These operational improvements also have a positive impact on the operating cost.

One improvement relating to the business process outcome is mobile access for customers in a TMS. End-to-end visibility of the goods that are transported is a great asset in terms of increasing customer satisfaction. In addition, a driverless transport system that is managed by a TMS improves the business process by reducing traffic congestion and CO₂ emissions, thus increasing lane capacity and reducing fuel consumption.⁵

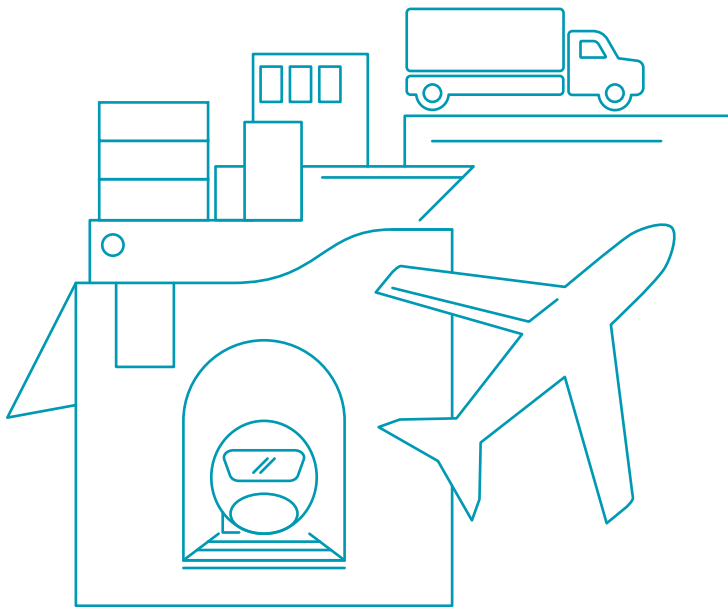
In conclusion, seven aggregated main trends for TMS can be identified, which affect the entire TMS market.

³ cf. Bundesvereinigung Logistik (2017), P. 21–22.

⁴ cf. Yasir Mehmood (2015), P. 2–5.

⁵ cf. Pete Goldin (2018).

Fig. 1 – TMS Trends⁶



- 1** Machine-to-Machine Communication between Companies
- 2** Mobile Access of Customers
- 3** Localisation Technology/RFID
- 4** Automation and Robotics & AI
- 5** Platform as a Service & Software as a Service
- 6** Driverless Transport Systems
- 7** Predictive Analytics

Source: Logistikmonitor 2018 – Der Wirtschaftszweig in Zahlen.

⁶ cf. Bundesvereinigung Logistik (2018), P. 26–33.

The Transportation Management System Survey

As a result of the TMS trends described previously, which are occurring in the Transportation Industry, Deloitte set up and conducted a major survey to analyze and identify insights on the TMS market. This survey is part of Deloitte's broader transportation practice and its work on TMSs to compare the offerings of TMS vendors. We conducted a three-month market study in the Q3/Q4 2019, which is based on Deloitte's leading 1 to 4th Party Logistics (1-4 PL) Service Provider structure and TMS Business Architecture Framework.

Logistics service provider (LSP)

Logistics service providers (LSPs) are companies that offer certain types of activities along the supply chain. These activities vary according to parameters, such as transport mode and type of goods, but they also depend on which party is handling the goods at a certain point in time along the supply chain. For instance, a shipping line owns vessels and offers to ship containers across ports. A contract logistics provider runs a warehouse and offers value-added services, such as pick and pack, labeling, and the partial production of goods. The first company focuses on sea freight and less on single-unit products, whereas the warehousing provider does. It should be highlighted that there are various methods of clustering these types of companies. Deloitte has developed an enhanced version of the classical 1-4 PL approach.

Deloitte's enhanced PL approach

The classical concept of first, second, third, and fourth party logistics (1-4 PL) providers is enhanced by the transport mode and by having a closer look at the chronological order of process steps along the supply chain.

The following multi-modal sea freight example illustrates this: an American fast-moving consumer goods company sells x number of cartons of shampoo to a retailer in France. The seller may be described as a 1PL shipper and its counterpart as a 1PL receiver or in this case a retailer.

Neither party owns a warehouse and has therefore outsourced that logistical service to two 3PL contract logistics providers. These parties take care of issuing and receiving cargo, storing it properly, pick and packing, and labeling. They also potentially provide other value-added services, such as changing the blister foil of shampoo bundles for a local language option, such as French.

Incoterms® between the seller and buyer are FCA port of load terminal. Therefore, the seller is obligated to deliver the goods to the US port of load, and the buyer is obligated to board the vessel and is responsible for main carriage via sea and for transporting the goods by truck to the final destination during on-carriage. As the seller's and buyer's core competency is not logistical services, they outsource their obligations to freight for-



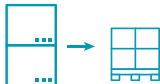

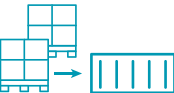

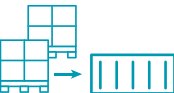

warders. The first freight forwarder is the one taking care of the pre-carriage to the port and may be described as a 2PL freight forwarder, which might be a firm focusing on domestic transportation only. The second freight forwarder takes care of the main- and on-carriage, as well as customs clearance; therefore, it is described as a 2PL freight forwarder cross-border. As these freight forwarders do not own trucks nor vessels, they need to outsource the actual transport of goods to carriers that own a means of transport. There are two 1PL carrier/trucking firms in the US and in France and there is one main carriage carrier, which is a 1PL carrier/shipping line.

Figure 2 illustrates the PL levels described for a full container load (FCL) scenario and a less container load (LCL) scenario. In the latter, the import freight forwarder looks into having the pallets consolidated with other shippers' cargo in order to ideally declare an FCL to the shipping line, as shipping lines mainly focus on dealing with containers and less on single-unit cargo, such as a carton or a pallet of shampoo.⁷

The granularity of product level, such as single units, cartons, pallets, or containers, can be found on the left-hand side in Figure 2. The chronological order of supply chain steps from the shipper's warehouse to the receiver's warehouse is indicated on the bottom line. The "X" in each column indicates the main focus of each party involved. Their individual business focus leads to individual TMS requirements, which are described in the following.

⁷ There are increased tendencies for main-leg carriers to want to enter the end-to-end supply chain market and to start accepting smaller cargo packages.

Fig. 2 – High-level Reflection on PL Types along Product Levels and the Supply Chain

Product Level	Shipper 1PL	Warehouse Provider 3PL						Warehouse Provider 3PL	Receiver 1PL
			Freight Forwarder 2PL (Export)				Freight Forwarder 2PL (Import)		
				Trucker 1PL	Shipping Line 1PL	Trucker 1PL			
 Bottle of shampoo	X	X						X	X
 Box of bottles	X	X						X	X
 1 pallet of n boxes	X	X	X	X		X	X	X	X
 n pallets filling a full sea freight container (FCL)	X	X	X	X		X	X	X	X
 Container full of products from 1 shipper			X	X	X	X	X		
 n pallets partially filling a sea freight container (LCL)	(X)	(X)	X	X		X	X	(X)	(X)
 Consol container full of products from n shipper			X	X	X	X	X		
 Truck, vessel, truck				X	X	X			

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X main focus

Disclaimer: Please note the “x” might be put in more places, such as bottle on the freight forwarder and carrier level, for example, in case of LQ DG. Yet, this overview highlights where the main focus is.

First, the 1PL shipper focuses on producing and selling bottles of shampoo at a very granular product level. They need to be able to store very detailed data in their systems, such as European Article Number codes, batch information, sizes of the single units produced, and their related shelf size requirements. In addition, their respective 3PL warehouse provider has to maintain the majority of that type of data. Information on correct storing, and pick and pack needs must also be captured; this includes warehouse location position based on ABC analysis of picking sequence. In addition, the contract logistics provider supports the distribution planning and therefore contacts the first 1PL carrier to pick up the pallets from the warehouse. As a result, the products will already have been consolidated to a higher level of product handling unit. For example, this can be a pallet, truck trailer, or sea freight container. Both situations lead to potentially different load and dock planning.

The 1PL carrier can either fill their trailer completely (FTL) or partially (LTL). In the case that their trailer is only partially filled, the 1PL carrier has to consolidate cargo from additional shippers in the most efficient and cost-saving route of transport that their TMS suggests. So, in this case, network and route planning play a key role.

The 2PL import freight forwarder might also receive a smaller load of goods (LCL) or a bigger load of goods (FCL). In the case of LCL, the freight forwarder will consolidate the pallets from shipper 1 with pallets from other shippers (US to France) before declaring an FCL to the shipping line.

The 1PL carrier shipping line has to focus on the vessel and therefore does not tend to accept cargo that is less than an FCL.⁸ In their TMS software, load planning needs to consider the capacities and requirements of a vessel and not just a container, as is the case for a 1PL road carrier. Road and sea route information, as well as weather forecasts and political factors play a role, next to static load requirements and equipment management.

It becomes clear that there are several parameters, which influence the logistics service provider cluster method. In order to highlight different needs in a TMS and having conducted substantial research on these matters, Deloitte has developed 12PL levels, as shown in Figure 3.

⁸ There are increased tendencies that main-leg carriers do want to enter the end-to-end supply chain market and have thus started accepting smaller cargo packages.

Fig. 3 – Deloitte's 12 Logistics Service Provider Levels

Deloitte's PL Level Group	Deloitte's PL Level	Deloitte's Definition of PL Level
Seller/Buyer	1PL Shipper/Consignees	= Companies that produce the goods and want them to be shipped. Companies that hire freight forwarders, usually to organize the transport. They are mostly the exporter/importer of the goods.
	1PL Retailer/Wholesaler	= Companies that focus on trading goods
Contract Logistics Providers	3PL Contract Logistics Providers & Warehousing	= Companies that offer warehousing & distribution coordination and value-added services
Freight Forwarder	2PL Freight Forwarder Domestic	= Companies that organize the transport of shippers/consignees and that engage carriers to conduct the transportation itself; they do not own trucks.
	2PL Freight Forwarder Cross-Border	= Companies that organize the transport of shippers/consignees and that engage carriers to conduct the transportation themselves.
Carrier	1PL Carrier Road/Trucking Firms	= (Partially) Owning trucks and (partially) employing drivers
	1PL Carrier Sea/Shipping Lines	= (Partially) Owning/wet or dry leasing/chartering vessels and (partially) employing captains
	1PL Carrier Air/Airlines	= (Partially) Owning/wet or dry leasing/chartering aircrafts and (partially) employing captains
	1PL Carrier Rail/Railway Companies	= (Partially) Owning/ leasing/chartering trains and (partially) employing drivers
	1PL Carrier Inland Waterways/Barge	= (Partially) Owning/wet or dry leasing/chartering vessels and (partially) employing captains
	1PL Carrier Parcel/Courier	= (Partially) Owning/wet or dry leasing /chartering aircrafts and (partially) employing staff
End-to-end Supply Chain Service Providers	4PL Lead Logistics Providers	= Companies that offer supply chain visibility across multiple carriers, freight forwarders, brokers, suppliers, and shippers; they focus on gathering shipment data.

TMS Business Architecture Framework

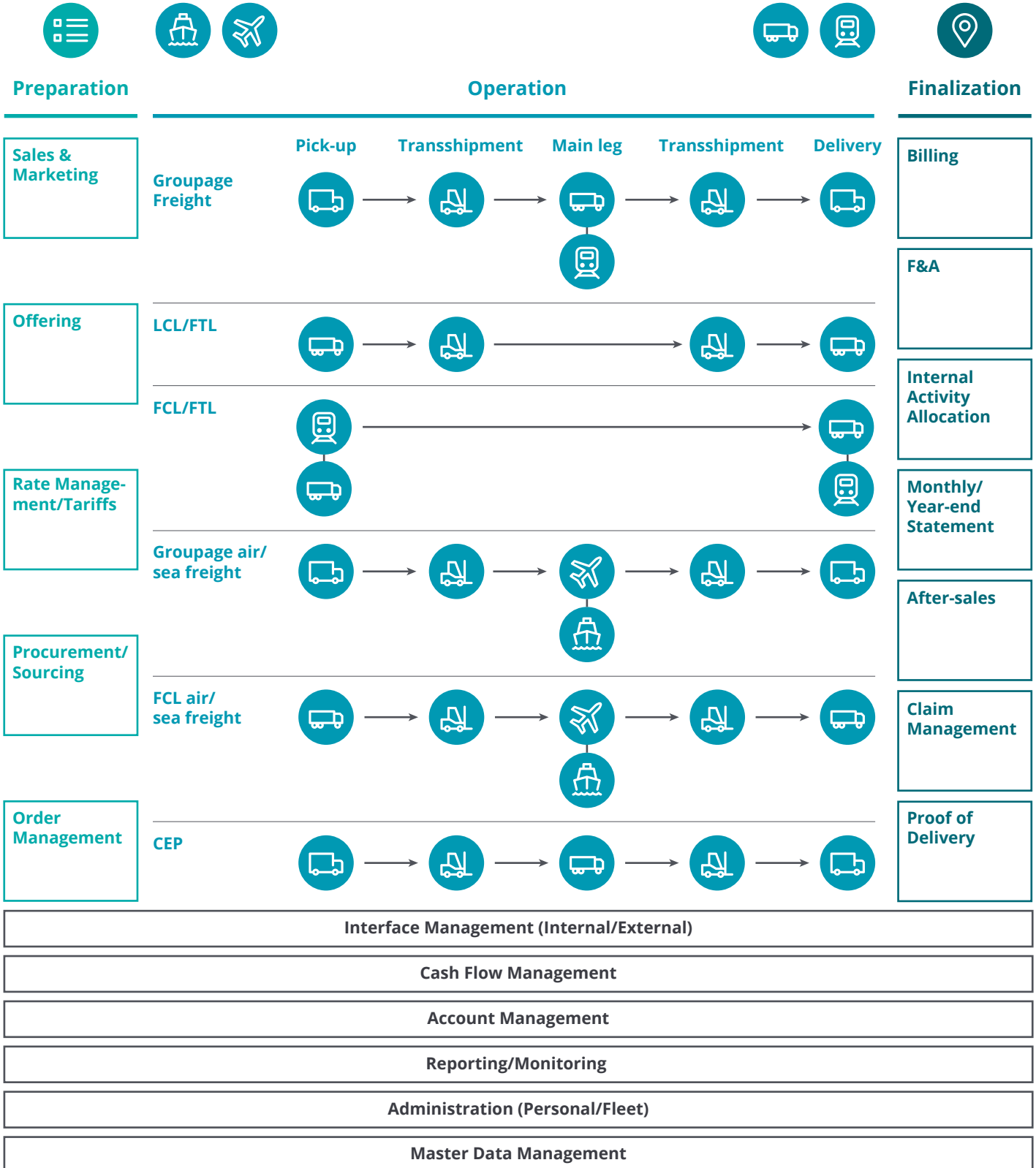
The TMS Business Architecture framework as a structural accelerator consists of four major modules:

- Preparation
- Operation (planning, operation, cross-cutting activities)
- Finalization
- Cross-cutting activities

A Transportation Management and Deloitte-specific Business Architecture helps the client to identify its structure and requirements. The Preparation Module comprises sales and marketing, offerings, rate management and tariffs, procurement and sourcing, and order management activities. The Operation Module is the very core of the TMS Business Architecture Framework and covers pick-up, transshipment, main leg, and delivery. The Finalization Module entails billing, F&A, internal activity allocation, after-sales, monthly/year-end statements, claim management, and receivables management activities. The cross-cutting functions are about interface management, both internal and external; cash-flow management; account management; reporting and monitoring; administration (personal and fleet); and master data management.

A Transportation Management and Deloitte-specific Business Architecture helps the client to identify its structure and requirements.

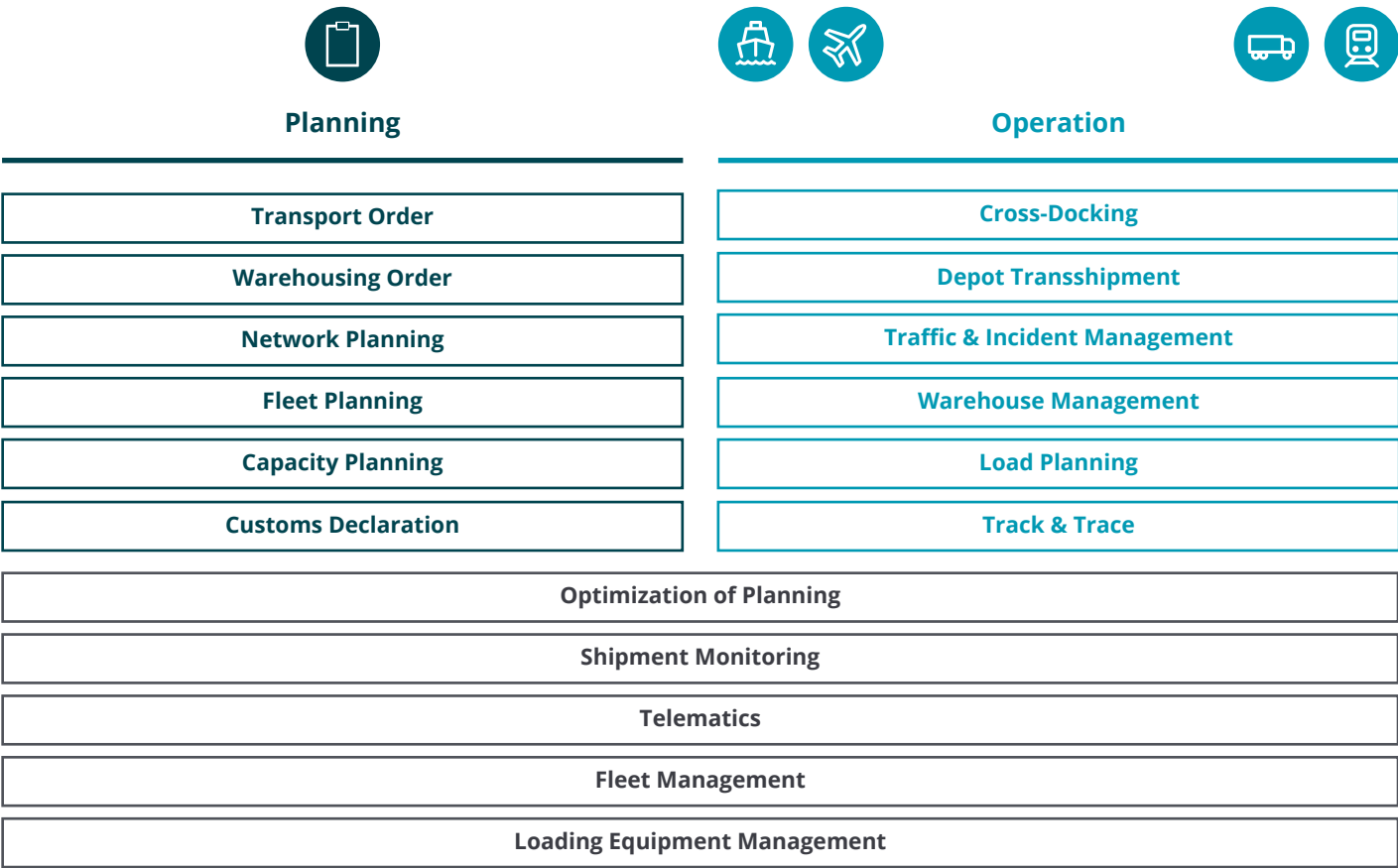
Fig. 4 – Preparation/Operation/Finalization Business Architecture Framework



Additionally, Deloitte applies a specific deep dive framework on the operation business architecture. The Operation part of the Business Architecture consists of a Planning Phase and an Operation Phase with its own modules. The Planning Module consists of transport order, warehousing order, network planning, fleet planning, capacity planning, and customs declaration. The

Operation Module consists of cross-docking, depot transshipment, traffic and incident management, warehouse management, load planning, and track and trace activities. These two phases are supported by the optimization of planning, shipment monitoring, telematics, fleet management, and loading equipment management.

Fig. 5 – Operation Business Architecture Framework



Survey details

To account for the global and diverse market of TMSs and to allow for a profound categorization of the selected vendors, this study draws on a sample of:

- An international selection of TMS vendors from Europe, the America, and Asia
- Both small to medium-sized and big vendors with more than 10,000 employees
- Both new entrants and long-standing market players
- Logistics platform providers that focus mainly on serving online marketplaces are out of scope

We reviewed selected vendors by means of an optimal data gathering mix in the form of a three-fold approach:

- Self-reporting via a detailed and sophisticated online survey designed according to Deloitte's TMS framework. Deloitte sent out individual survey links to the relevant contacts verified upfront. The self-reporting was done by sales and IT experts, and could be stopped and re-started at any time.
- If applicable, bilateral exchanges via phone with specific vendors enriched and fine-tuned the results to clarify questions in case of uncertainty and to maximize the response rate.
- Based on an external perspective determined using diligent desktop research. Using desktop research, responses from the online survey and bilateral exchanges could be backed and, if necessary, enriched.

The responses of all vendors were gathered, normalized, and anonymized to descriptively aggregate, properly compare, and derive conclusions per categories of vendors. The detailed results can be found in the section below.

Our in-depth survey is based on Deloitte's 12 Logistics service provider levels and TMS business architecture.



Insights on the TMS Market

What does the structure of the vendors look like?

In summary, it can be said that all three indicators (number of clients, revenue, and number of employees) show growth from 2017 to 2018. The smaller segments recorded clear declines, while the larger segment grew. This can be seen especially in revenues, where instead of 33 percent in the previous year, 56 percent now report revenues of up to 100 million euros.

In addition to the investigation and differentiation the different TMSs offer, this study also takes a closer look at the individual vendors. In order to get a better overview of their structures, we asked about the following key figures in our survey: number of clients, revenue, and number of employees.

Figures 6 and 7 show the number of clients for the years 2017 and 2018, respectively. If one starts with vendors who stated that they serve up to 100 clients, it can be seen that this segment has been reduced by 15 percent within one year. At the same time, 5 percent stated that they would serve up to 5,000 customers in 2018. Previously in 2017, no one had mentioned this segment. The largest percentage increase was achieved in the segment serving up to 1,000 customers. In 2017, 50 percent of the vendors were serving this segment, with the figure increasing to 60 percent in 2018. The highest possible segment included up to 10,000 customers, which remained constant at 10 percent from 2017 to 2018.

Fig. 6 – Number of clients per Vendor, 2017

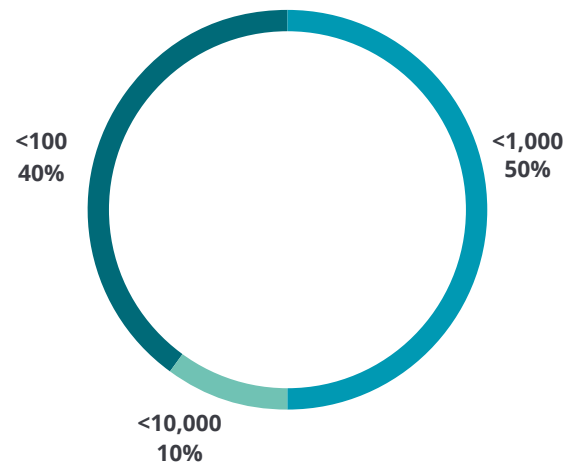
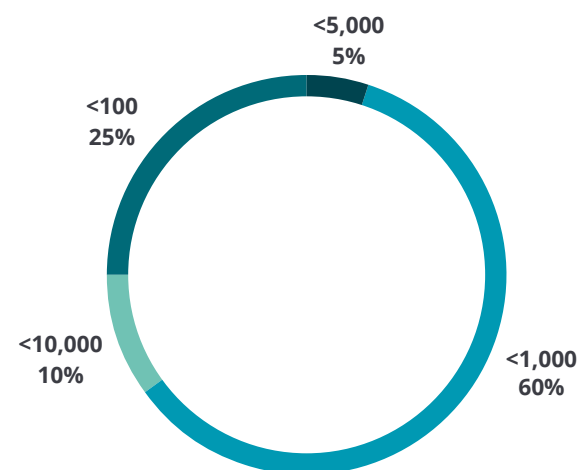


Fig. 7 – Number of clients per Vendor, 2018



If one looks at the reported revenue of the vendors, a clear trend can be seen. In 2017, 11 percent still reported revenues of up to 1 million euros. In 2018, this segment no longer existed. However, the segment with revenues of up to 5 million euros increased from 11 percent to 22 percent, thus doubling. The same applies to the segment of 10 million euros, where 33 percent still stated that they would make a turnover of up to 10 million euros in 2017; this figure was only 17 percent in 2018. However, sales of up to 100 million euros represented a 17 percent increase from 39 percent to 56 percent in 2018. Most recently, as much as 6 percent reported sales of more than 100 million euros in 2017. This figure fell by 1 percent in 2018 and thus remained almost constant.

Fig.8 – Revenue 2017

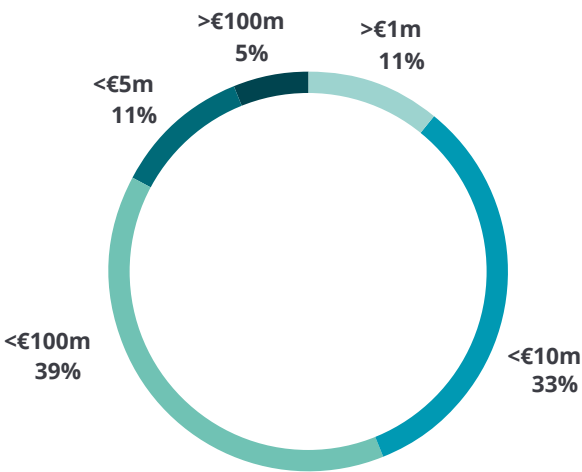
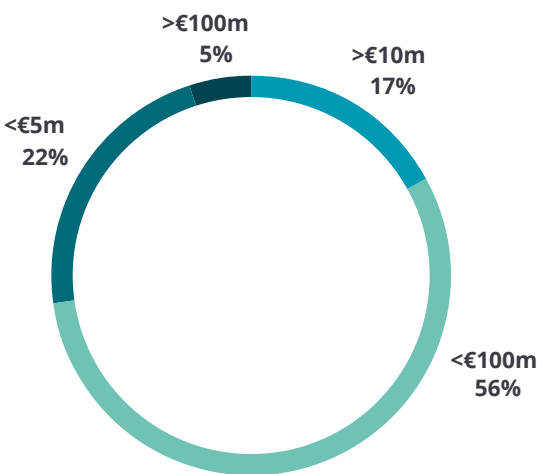


Fig.9 – Revenue 2018



If one looks at the number of employees, it remains almost unchanged. In both 2017 and 2018, 25 percent of the survey participants stated that their companies had up to 1,000 employees, and 5 percent confirmed that they had more than 10,000 employees. The majority of the vendors stated that they had up to 100 employees. In 2017, the figure was 65 percent, but in 2018 it decreased to 60 percent. According to the report, the only increase is in the number of vendors who reportedly employ up to 5,000 people. In 2017, the figure was 5 percent, whereas in 2018 10 percent reported this number of employees.

Fig.10 – Employees 2017

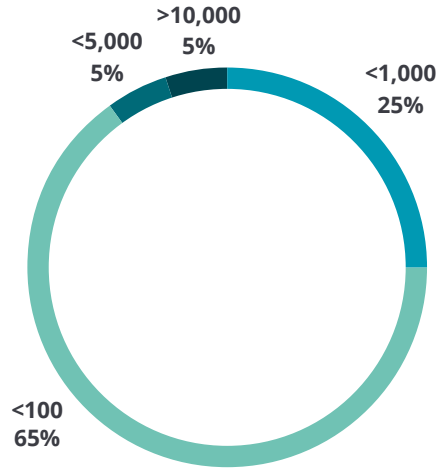
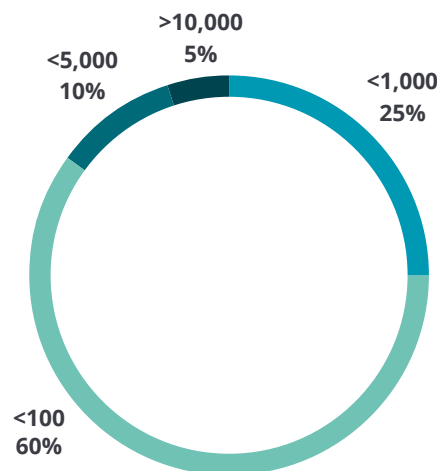


Fig. 11 – Employees 2018



The majority of vendors had up to 100 employees in 2017/2018.

What is the geographical distribution of TMS vendors?

The survey shows the geographic distribution of TMS vendors and their operating regions, sales authority, support resources, and server locations.

Looking at the details of the operating regions, Figure 12 shows that most of the vendors are operating in Europe. Ninety percent of all vendors in Germany and the EU (non-Germany) and 85 percent in Europe (non-EU), whereas just 25 percent of all vendors are acting in the Middle East, Pacific and South America. All of the vendors are operating globally. None of the vendors are just acting in one region, and the majority (65 percent) are operating in more than four regions. In addition, the vendor with the highest number of employees in 2018 (>10,000) covers all regions.

The details also show that the distribution of the operating regions correlates with the number of clients. Those vendors with the highest number of clients (< 10,000 clients in 2018) concentrate on the European market with 100 percent coverage in Germany and the EU (non-Germany). In addition, those vendors who are acting in all regions also have high total revenue (2018) with a minimum of <100 million euros. Furthermore, the vendor with the highest revenue is acting in 45 percent of the regions.

One reason for this distribution relates to the international trade volumes. High volumes are generated by Europe, particularly by the China–Europe trade, which increased from 306 billion US dollars in 2007 to 573 billion USD in 2017.⁹ For this reason, it is important for transport logistics companies to have a localized operative facility and be present globally.

The distribution of the sales authority shows that TMS vendors are highly involved in the European market. All the companies have a sales authority in Germany. In addition, most of the vendors are acting internationally, and just one vendor is focused on one market (Germany) only. Twenty percent of the vendors have a sales author-

ity in all regions. Looking at the details, there is a high degree of fragmentation in correlation with the number of clients. The vendors with the highest number of clients have a range of 1–4 regions, and those with the lowest number of clients range from 20–100 percent coverage.

Transportation logistics is an international industry sector. This is reflected by the global export volume worldwide, which increased from 15,303 billion US dollars in 2010 to 19,453 billion US dollars in 2018.¹⁰

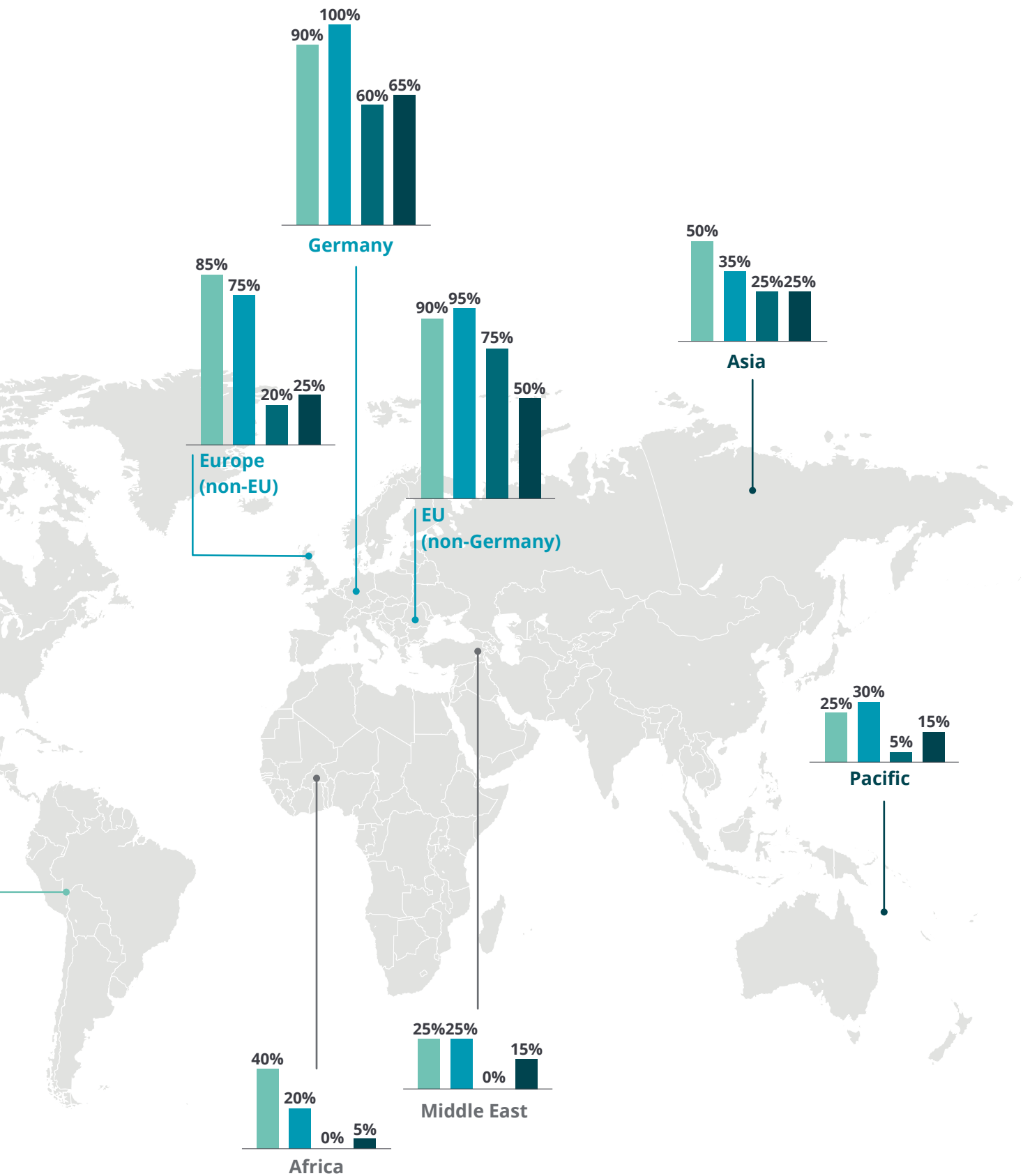
In comparison to the regional distribution operations and sales authority, support resources act more locally. None of the vendors have a supporting function in all regions. Furthermore, 35 percent of all vendors are bound to just one region and therefore are located in Europe; 43 percent are located in Germany, 43 percent in the EU (non-Germany), and 14 percent in Europe (non-EU). Regarding the support resources, it also needs to be highlighted that the African region and the Middle East are not covered at all by vendors and that the Pacific region and South America are just covered by 5 percent of all vendors.

Fig. 12 – Geographical Distribution



⁹ Vgl. PwC (2019), S. 11.

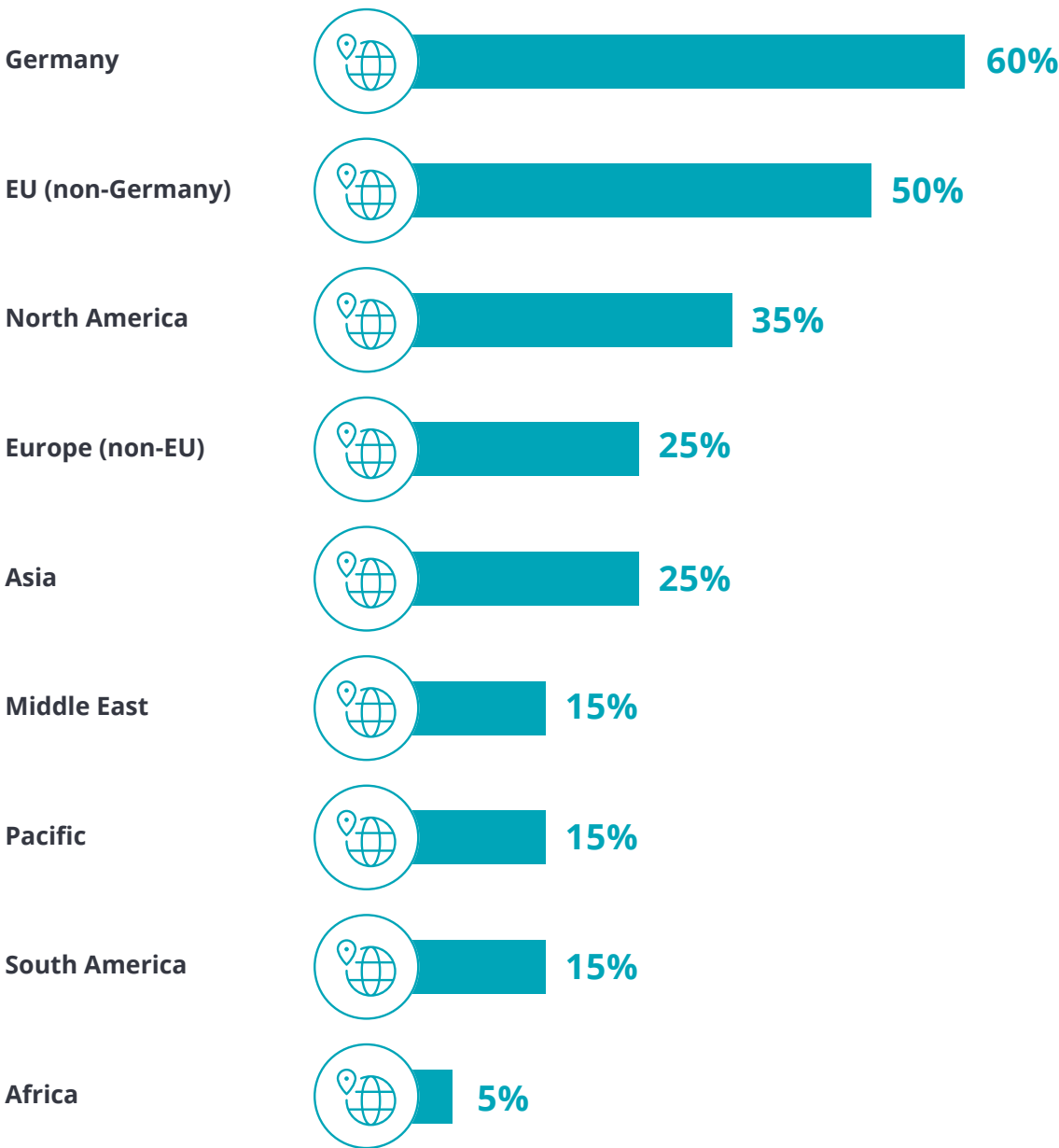
¹⁰ Vgl. Statista (2020).



Looking at server locations, it is striking that there is in general a low amount of coverage, with an average of 28 percent of coverage over all regions. Africa is the only region that is just covered by one vendor. It should also be highlighted that the servers

are either located in the EU (Germany and non-Germany) and/or in North America. However, those vendors that cover more than 75 percent of regions also have a high minimum revenue of < 100 million euros.

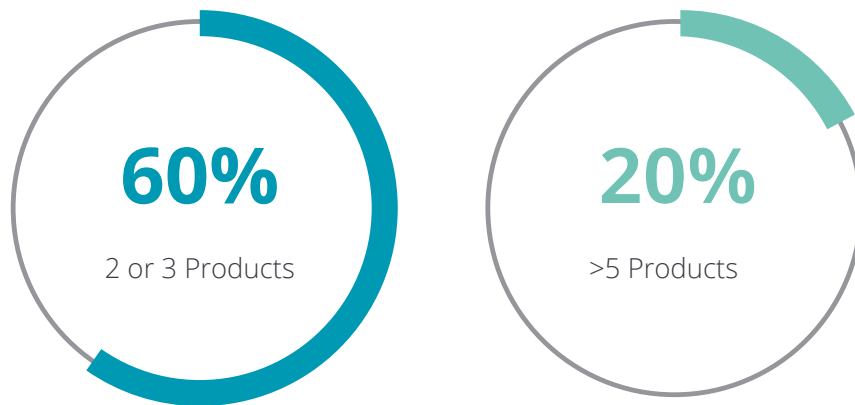
Fig. 13 – Geographical Distribution – Server Location



How many products do the vendors offer?

A minority of the selected vendors cover customers' needs with one product only. Sixty percent of the vendors mention having two or three products, while 20 percent of the software providers have developed five or more products. This leads to very vendor-specialized solutions for different customers and greater business coverage for customers.

Fig. 14 – Product



Looking at the group of vendors with five or more products, we notice that all vendors have customizable solutions. The overall number of customizable solutions sits at around 70 percent only. Furthermore, the vendors with five or more products are more likely those with a higher revenue.

However, we have a small number of vendors offering one product only. It seems that the product is very specialized for a specific customer group, that the vendor size in terms of number of employees is small, and that revenue is also rather small. The vendors have a higher share in local solutions and customers in Europe only. However the clients are located on several continents.

Regarding the change of language of each tool, as expected, all providers offer an English version of the tool; only one software program does not support the German language. Other international languages, such as Spanish and French, are covered in more than half of the programs. In addition, a small number of vendors offer the option to translate the software front end into any language the customer would like. They also cover other languages, such as Polish, Danish, Dutch, Chinese, Thai, and Korean. In a globalized supply chain, the system requires that different currencies are used. This is also offered by almost all vendors using a conversion table.

While having only certified users being allowed to use the program this trend is overturned and for one program only is a user certification required before being allowed to use the software. In most cases, user certification is no longer necessary in order to use the program. All vendors offer standard support channels, such as telephone and email service. Some vendors also offer in-person/on-site support if required. This necessitates having qualified experts at each customer location. Detailed training is therefore necessary for customer service employees to become experts in the tool, where no on-site support is available. Some rare support channels are also supported in order to reach customers the best way possible.

What business modules do the vendors offer?

Our survey shows that a vast majority of the selected vendors offer key functions according to Deloitte's TMS Business Architecture Framework. Yet, differences become apparent when looking at a more granular module level.

Not all the TMS providers in the study have a full-blown preparation module at hand for their clients. Only about half of the companies analyzed have dedicated sales and marketing, procurement, and sourcing functions. Approximately three-quarters of the selected vendors have an offering and order management available in their product portfolio.

We can deduce valuable insights about the operation business architecture of the selected vendors. On average, more than 75 percent of all researched providers have a comprehensive planning phase related to operation business. All the companies analyzed offer a transport order function. The vast majority has warehouse order, fleet, network, capacity planning, and customs declaration functions. Likewise, we see that most vendors have end-to-end operation activity. For instance, all TMS companies provide transshipment possibilities in their products, and almost all of them allow for cross-docking and traffic and incident management. More than 50 percent offer load planning and warehouse management functions to their clients. Most vendors support their operation business architecture diligently; all vendors have shipment monitoring using either their own or third-party products. Almost all of them optimize planning functions, and a majority offers fleet management and loading equipment management.

We can draw a similar picture when it comes to the finalization module. More than three-quarters of all selected vendors have a billing function and offer proof of delivery. More than half of them have finance and accounting, claim management, internal activity, and monthly/year-end statement functions.

Finally, when we look at the cross-cutting module, a majority of providers offer a comprehensive stack. Almost all of them have interface management, reporting and monitoring, and master data management functions. More than 50 percent have administration, account management, and cash flow management functions available for their clients.

The vast majority of the selected vendors offer key functions according to Deloitte's TMS Business Architecture Framework.

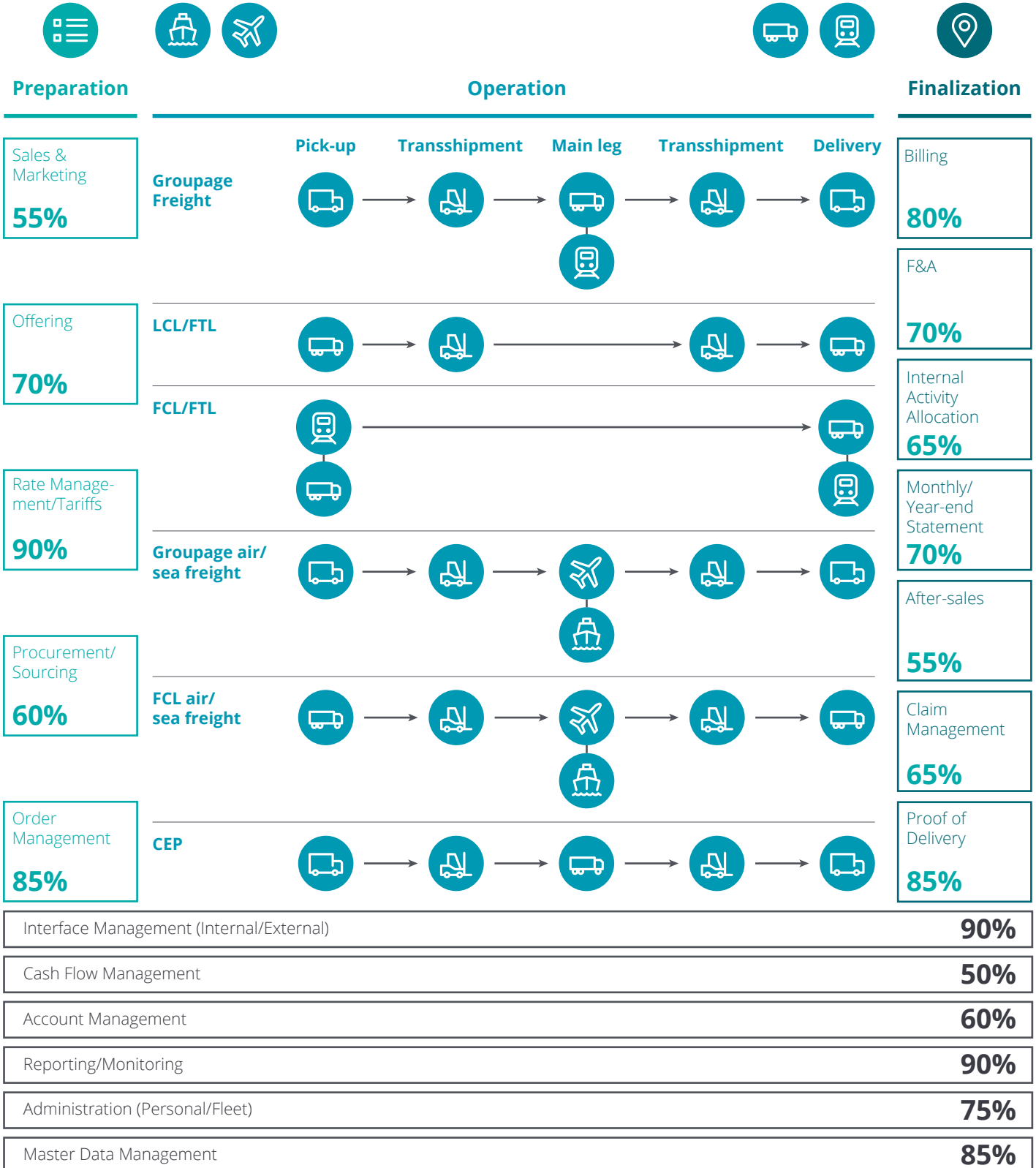





Fig. 15 – Business Architecture – Coverage I


Fig. 16 – Business Architecture – Coverage II

<div>  </div> Planning		<div>     </div> Operation	
Transport Order	100%	Cross-Docking	90%
Warehousing Order	75%	Depot Transshipment	100%
Network Planning	70%	Traffic & Incident Management	80%
Fleet Planning	85%	Warehouse Management	50%
Capacity Planning	85%	Load Planning	70%
Customs Declaration	65%	Track & Trace	90%
Optimization of Planning		90%	
Shipment Monitoring		100%	
Telematics		90%	
Fleet Management		70%	
Loading Equipment Management		65%	

Transport Orders, Depot Transshipments and Shipment Monitoring Modules are operational standards for all vendors.

How many transport modes are served by the vendor's TMS?

Our study also examined the different transport modes of the individual vendors—air, ocean, road, inland waterway, and rail. The vendors described which transport modes they use within their TMS system.

We made a listing that shows which transport modes are most frequently offered in the vendors' TMSs. Without exception, all the interviewees indicated that the transport mode Road is incorporated in their TMS. This is followed by Rail at 80 percent. Ocean and Inland Waterway are the third most popular transport modes at 60 percent each. Only every second operator uses the transport mode Air.

In addition to a percentage view of the individual transport modes, the study also looked at how many transport modes the individual vendors ultimately offer. It turns out that only 25 percent of the vendors use less than three transport modes in their TMSs. A quarter use four transport modes and about 30 percent said they can use all transport modes. In the case where only four out of five transport modes are used, the missing mode is either Air or Inland Waterway. From this result, it can be deduced that the trend in TMSs is towards a comprehensive and cross-functional system.

In summary, the transport mode Road is the main mode for TMSs and has a 100 percent compatibility rate. Further, a clear trend towards TMSs with several transport modes can be seen. Therefore, there is a clear demand for the entire supply chain to be mapped end to end in one system. The vendors are fulfilling this demand by providing a broad-based TMS.

Fig. 17 – Overview of Transport Modes

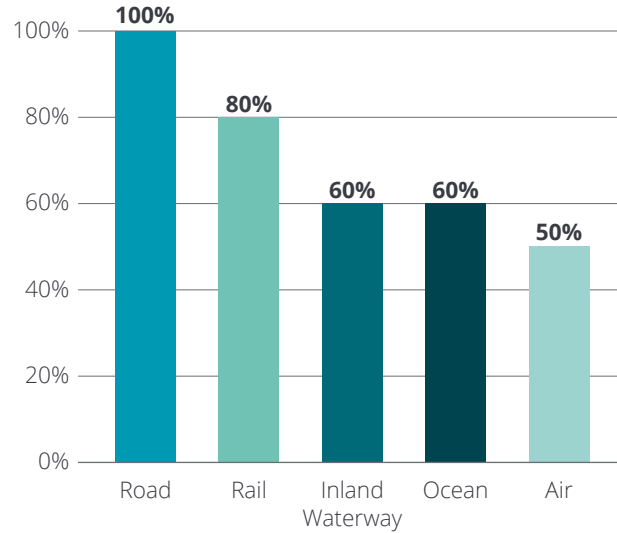
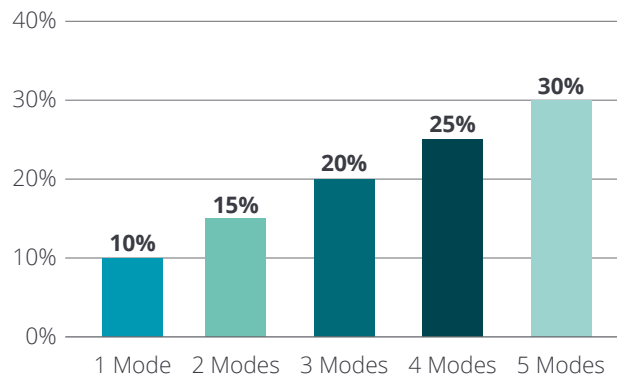


Fig. 18 – Transport Modes - Vendors



What does the coverage of the logistics service providers look like?

The survey results reflect the current market coverage of TMS product types among the participants. The participants were asked whether their product could cover the required functionalities of the 12 Deloitte PL levels.

The highest TMS functionality coverage is in the area of Contract Logistics and Warehousing and Freight Forwarding. The lowest coverage is in the area of conducting transportation via Carrier Air, Sea, Inland Waterway, and Rail.

Looking more closely at the actual transportation (1PL carriers), it becomes clear that the transport mode is indeed a vital parameter to distinguish PL types. TMS coverage is mainly given for road transportation. However, when it comes to the TMS requirements of airlines and shipping lines or inland waterway transportation, the functionalities of the TMSs surveyed are not sufficient.

This result may be due to very different transport requirements. Shipping cargo on an airplane requires different metrics and calculations than shipping bulk cargo on an inland waterway barge or by rail. Not only does the load planning differ significantly, but so do the factors relating to maintenance, such as tire pressure or A to D checks of an airplane. The weight distribution of cargo on board a vessel which has to deal with strong winds and waves is very different to the weight distribution requirements on trucks. Many parameters play a role in each sub-area of Deloitte’s Business Architecture Framework.

Fig. 19 – 1-4 PL - Overview

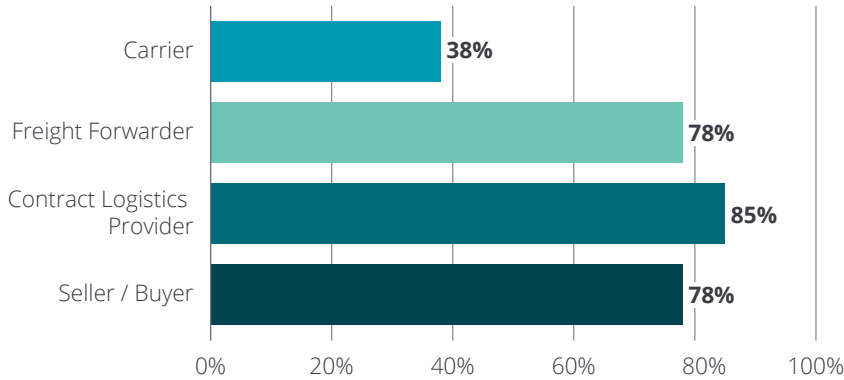
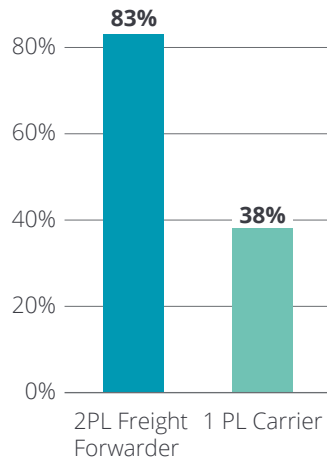


Fig. 20 – 1-4 PL – TMS Coverage

TMS product for PL type	TMS coverage
1PL Carrier Road / Trucking firms	75%
1PL Carrier Parcel / Courier	50%
1PL Carrier Rail / Railway Companies	40%
1PL Carrier Sea / Shipping Lines	25%
1PL Carrier Inland Waterways / Barge	20%
1PL Carrier Air / Airlines	15%

Regarding PL-type freight forwarding, various transport modes and means of transport need to be taken into consideration, but on a planning rather than conducting level. This means that the forwarder has to be able to deal with all transport modes, but they do not have to conduct the transport themselves, as they tend not to own means of transport, such as an airplane or a truck. For instance, complex route optimization planning in order to reduce empty drives and save petrol is less relevant to a 2PL freight forwarder compared with a 1PL carrier trucker firm. This may be one of the reasons why TMS coverage for freight forwarding is higher than for carriage.

Fig. 21 – 1-4 PL – 2PL Freight Forwarder/1 PL Carrier



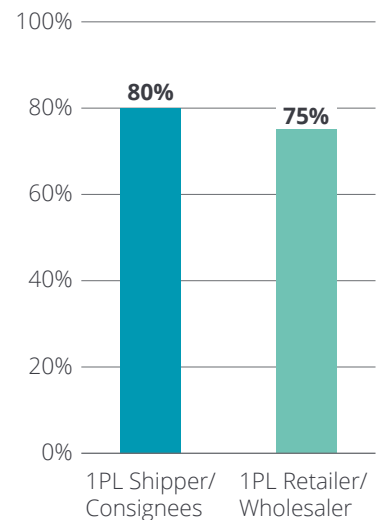
However, in the area of freight forwarding, other parameters play an even more vital role, such as incoterms, customs, and port connections. These end-to-end factors require increased interconnectivity across the pre, main, and on-carriage movements among various parties. In particular, consolidation planning becomes more complex. Chargeable weight has to be calculated for various transport modes in multi-modal operations. Therefore, TMSs should be able to interlink the three leg shipments. This is also true for other reasons, such as the sealing of containers.

When sealing a container in the ship-from-warehouse stage (potentially by a 3PL contract logistics provider who has to inform the 1PL shipper), the container and seal number should move from shipment one

to the main carriage (for example, being able to inform the port authorities and shipping line out of that TMS object) and move on to the on-carriage (for example, being able to inform the trucker that goods are customs cleared by the 3PL freight forwarder and may be picked up from the port depending on the Incoterm).

Regarding shippers, a distinction between retailer/wholesaler and producer has been made. The reason for this is that the focus on last mile delivery, smaller sales units and potentially an increased frequency of sales and returns are to be covered within a retailer's TMS. The TMS coverage in the area of the producer is 5 percent higher due to the specific requirements in this area of business being higher.

Fig.22 – 1-4 PL – 1PL Shipper/Consignee/ 1 PL Retailer/Wholesaler



No single TMS serves all parties along the supply chain. Deloitte recommends analyzing the TMS requirements based on the 12PL levels and the Deloitte Business Architecture Framework to identify a TMS with the right PL level for each company's business focus.

How does technology influence TMS vendors?

Regarding the ability of a TMS product to support a device, it has been shown that the majority of vendors are able to support all devices. Approximately 90 percent of the vendor solutions are applicable for tablets and 80 percent for smartphones. Just two vendors offer a desktop version without supporting other devices. This also reflects the demand of the transport logistic industry to apply a multi-device solution. This is important, for example, for smoother interaction with the user and more specifically with the truck driver.

Fig. 23 – Devices – Tablet

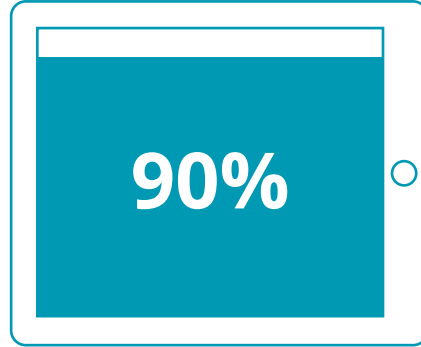


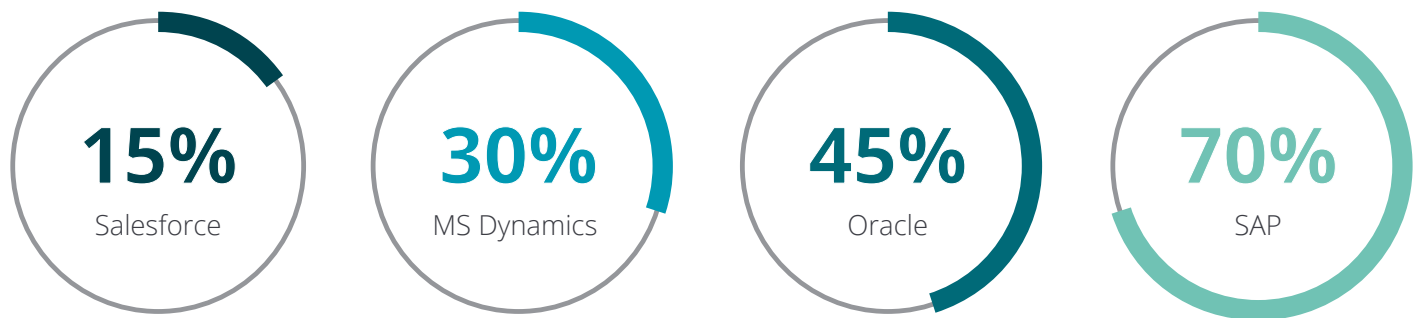
Fig. 24 – Devices – Smartphone



The majority of TMS vendors are investing in future-oriented technologies such as IoT, RPA, and Cloud Solutions. More than two-thirds of them, however, are using on-premise systems instead of a fully-integrated, cloud-based solution.

Regarding the software environments of TMSs, it can be clearly stated that the majority (70 percent) of the vendors are able to use SAP. In addition, 45 percent are able to use Oracle, 30 percent are able to use MS Dynamics, and 15 percent are able to use Salesforce.

Fig. 25 – Software Environment



Concerning future-oriented technologies, half of the vendors are investing in Internet of Things (IoT) and robotics process automation (RPA) technologies. Nevertheless, there is no correlation between RPA and IoT, which means that if a vendor is using IoT, it does not necessarily also invest in RPA.

TMS vendors are also using cloud technologies. Even if it is a technology future topic, just 70 percent of vendors still offering an on-premises software. Even if cloud solutions are seen as a high-value future possibility, only 70 percent of vendors offer an on-premise software solution. Regarding the details of cloud solutions, the survey shows that 85 percent of the vendors offer a SaaS solution. Just 10 percent stated that they offer an IaaS or PaaS solution. Those vendors that offer an IaaS and PaaS solution also have the possibility of offering an on-premises SaaS solution.

These survey outcomes are reflected by the industry, and the vendors know the importance of paying attention to the topics described here. The global growth rate for global RPA and predictive maintenance markets in the period 2016–2021 is forecasted to be >35 percent, showing the importance of this technology. In addition, the Intelligent Transport System market in the road transport industry segment is expected to reach over 72.3 billion US dollars by 2022.¹¹

The use of smartphones and tablets – and therefore apps – is not seen as a major focus topic for TMS vendors. Just 26.1 percent of users in global supply chain management are using apps for transport controlling and tour evaluation, 15.9 percent are using an app for order management, and 10.2 percent are using an app for loading activities.¹²

¹¹ Vgl. PWC (2019), S.13.

¹² Vgl. Statista (2018).

Conclusion

Fragmentation or Consolidation of the TMS Market?

This TMS compass shows a fragmented TMS market in terms of geographical distribution. Four of the vendors have a worldwide distribution of sales authorities, that is, in North America, South America, the EU (non-Germany), Europe (non-EU), Germany, Africa, the Middle East, Asia, and the Pacific. It should be noted that two of those four vendors also have revenue of up to 100 million euros.

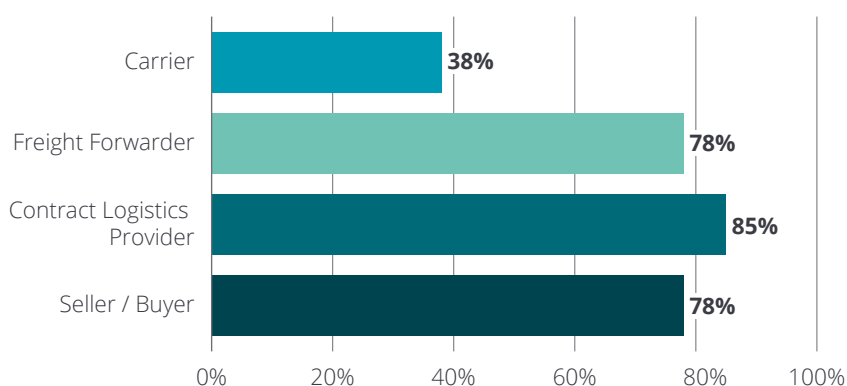
The number of employees and clients also reflects a fragmented market. 25 percent of the vendors have fewer than 1,000 employees, 60 percent have fewer than 100, 5 percent have fewer than 5,000 employees, and 10 percent have more than 10,000 clients. The majority of vendors (60 percent) have fewer than 1,000 clients, but 25 percent have fewer than 100, 5 percent have fewer than 5,000, and 10 percent have fewer than 10,000 employees.

The coverage of the Business Architecture shows a different picture. The operating modules are mostly covered by the TMS vendors, and therefore end-to-end operating activity is almost a given. This is especially shown in the planning phase and in the warehouse order, fleet, network, capacity planning, and customs declaration functions. Fragmentation of the TMS business processes cannot be found in the preparation, crosscutting, or finalization modules.

The distribution of the 1-4 service logistic providers shows that vendors are trying to cover most or all target groups, even if the number of carriers is low. 75 percent of the vendors cover carrier-road and 50 percent cover the CEP group.

On the bottom line, a fragmented market is not given for process and target group orientation, but still fragmentation is indicated by the geographical distribution of the sales authorities, the number of clients, and the number of employees.

Fig. 26 – 1-4 PL

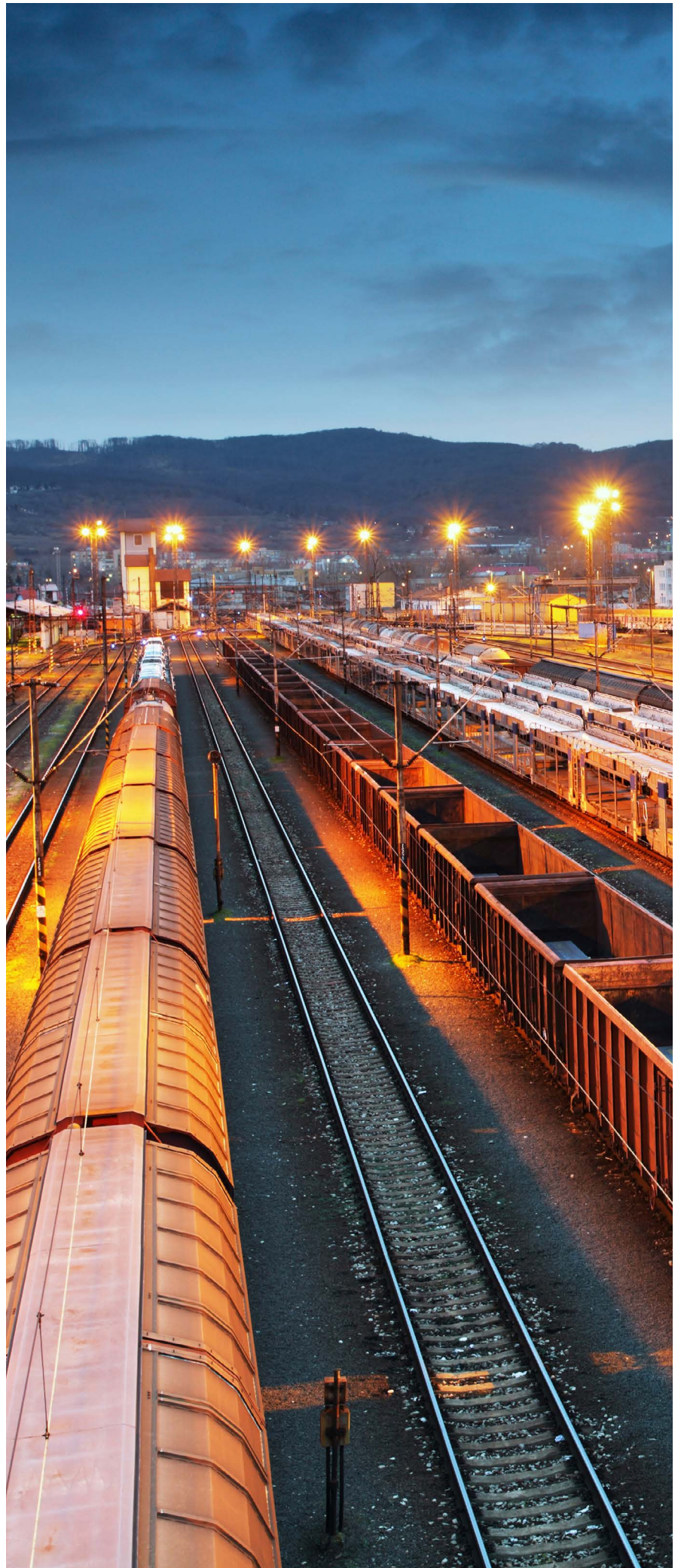
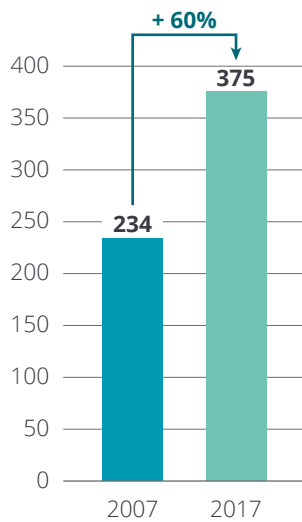


Choose the right country!

Asia-Europe trade has the highest transport volumes worldwide and the highest growth rates from 2007 to 2015. These high volumes are also reflected in the TMS compass.

Fig. 27 – Asia-Europe Trade Volume¹³

China-EU Import Trade Value 2007–2017
(in billions USD)

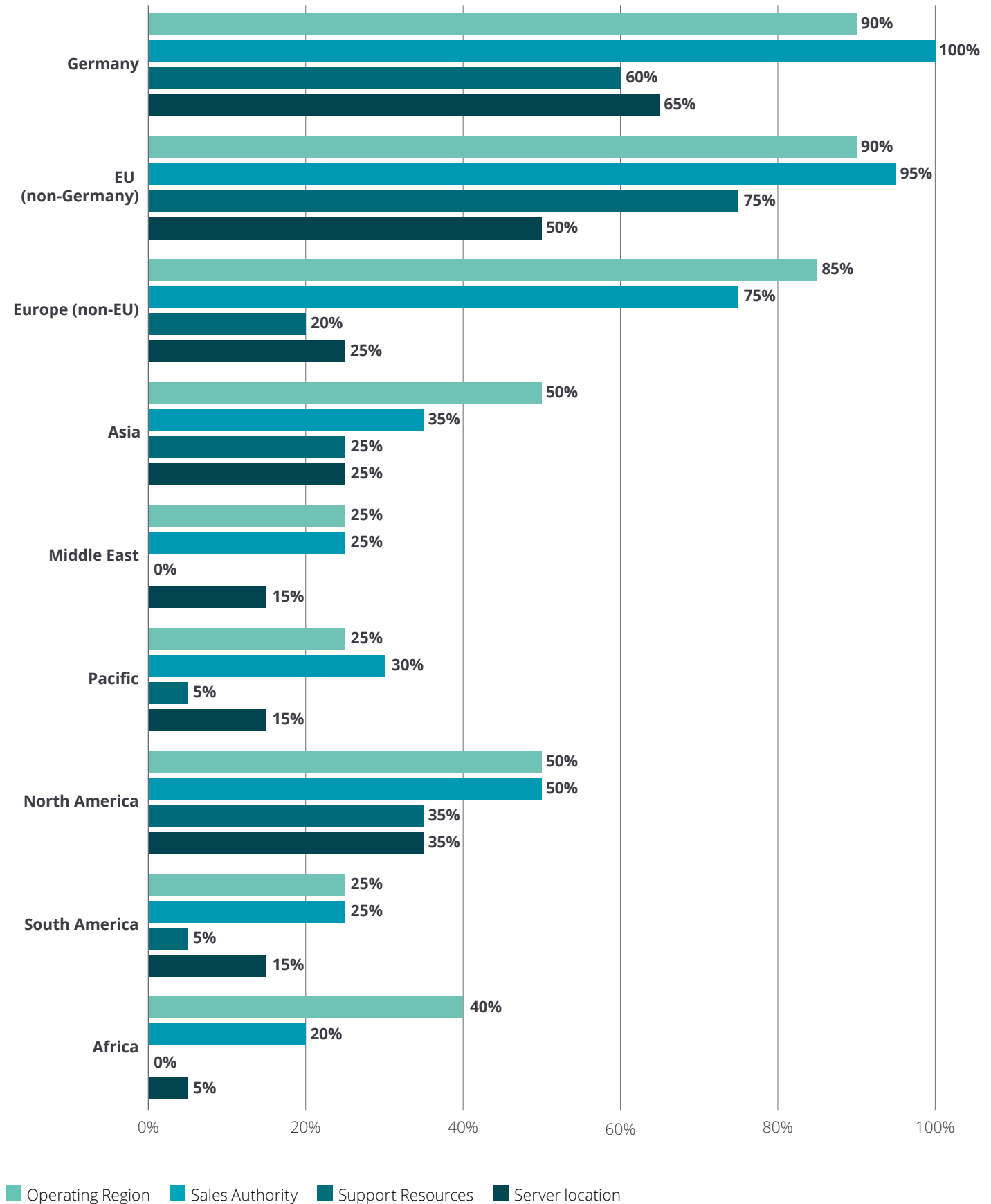


¹³ Vgl. PwC (2019), S. 11.



The numbers in all areas of the geographical distribution in Germany and the EU (non-Germany) are the highest in the survey. The clients of vendors are situated (hub, warehouse, or headquarter location) in the countries where the highest volumes are imported. Consequently, it is necessary for vendors to set up their operation facilities, sales authorities, and support resources in those countries.

Fig. 28 – Geographical Distribution – Details





The Deloitte Outlook

There is no TMS covering all the requirements of the different companies and their PL types. Often, vendors take into consideration different target groups. Firstly, a significant number of vendors differentiate between freight forwarder and shipping (industry) companies and therefore offer different modules for their target groups. This is reflected in the number of products provided by vendors. Sixty percent of all the vendors offer more than two or three products, and 20 percent have more than five products in their portfolio for different customer groups.

Secondly, vendors take the PL types and business architecture of a client target group into consideration. This means

they focus on the details of different core processes and software capabilities. For this specialization, a customizable solution is needed. This requirement is covered by 75 percent of the vendors, who state they offer customizable solutions.

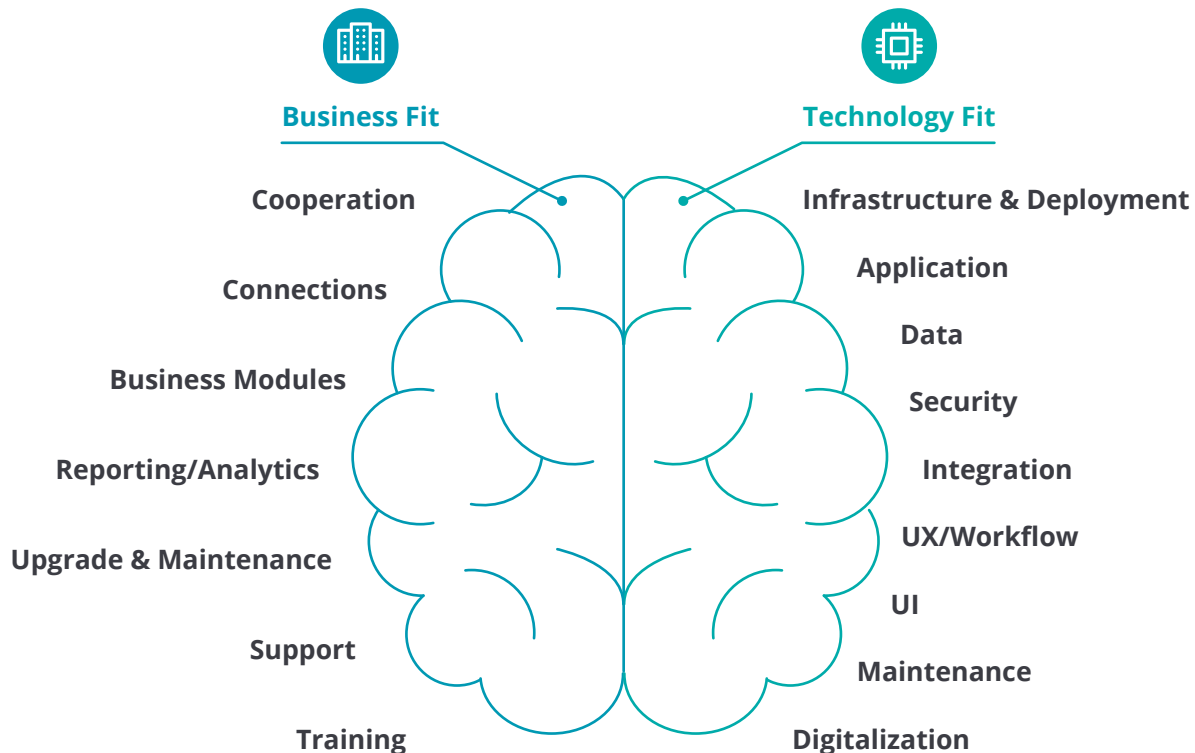
Regarding different technology requirements, vendors take into consideration the future needs of the customers. Different vendors have different software environments, such as SAP, MS Dynamics, Salesforce, or Oracle. In terms of cloud solutions, 70 percent of the vendors have a SaaS product solution, whereas just two vendors have a PaaS product solution.

The results of the study show that TMS providers still differ greatly in their individual

business architecture. It appears that TMS providers adapt to different market needs and target customers, and have different levels of maturity in terms of the individual modules. Therefore, TMS buyers are advised to be very diligent when it comes to choosing a vendor. In order to properly serve business needs, an individual assessment is highly recommended.

By reflecting the results of the survey, we can determine that every company needs to identify their potential for improvement in a structure and efficient way in order to generate greater business value.

Fig. 29 – Deloitte Standardized Transportation Management Evaluation Standard



Endnotes

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