

*Driving Aftermarket Value:
Upgrade Spare Parts Supply Chain*
Deloitte China Auto Industry Spare Parts
Management Benchmark Survey White Paper



Background Introduction

"A business absolutely devoted to service will have only one worry about profits. They will be embarrassingly large," Henry Ford, founder of one of the world's largest manufacturing companies, once said. The evidence suggests that the leading companies making efforts to abide by this concept have achieved success and been amply rewarded for their continuous investment in service.

In today's automotive market, sound after-sales service has become a critical success factor in new car sales. At the same time, along with the sharp increase in customer numbers, spare parts and service business is creating reliable revenues and considerable profits for automotive companies.

Since 2003, Deloitte Consulting has carried out a global after-sales and parts management benchmark study every two years, covering five major industries including automotive, aerospace manufacturing, and high-tech manufacturing among others. The latest benchmark study covers more than 137 corporations, including over 30 major automotive manufacturers, and provides benchmark guidance for spare parts management (SPM) in the global automotive industry.

Leveraging Deloitte's advanced global survey tools, Deloitte Consulting China conducted a nationwide SPM Benchmark Survey in China's Automotive Industry this year, which aims at benchmarking and understanding spare parts management in China's automotive industry. The survey mainly covers the overall strategic positioning of the spare parts business, distribution network, forecasting and inventory planning, transportation and logistics management, IT system implementation, as well SPM KPI benchmarking. The survey covers 12 major China OEMs including Shanghai VW, FAW-VW, FAW Toyota, GAC Toyota, Dongfeng Nissan, Changan Automotive, Changan Ford, GMAC-SAIC, Great Wall Motor, BAIC Motor, Geely, and Chery.

We would like to express our sincere gratitude to the OEMs and logistics companies mentioned above for their contributions to this survey. Through our discussions with numerous industry experts and leaders, we discovered that

- As China's automotive market has matured, the potential of the after-sales market has started to be gradually realized. The spare parts business has become more strategically important and will become one of the key areas for future competition. China OEMs are at a critical stage for strategic repositioning of the spare parts business.
- Spare parts supply chain management is more complicated than that of finished products, with the challenges stemming from the huge number in parts SKUs, unstable and unpredictable demand, as well as the complexity of the overall supply and distribution network.
- In terms of operating results of the parts business, Chinese OEMs' performance appears to be in line with those of OEMs in mature markets regardless of business size. However, SPM capabilities and performance vary widely among different OEMs, and many companies still have not fully established operational KPI systems for their spare parts businesses.
- The top barriers faced by Chinese OEMs in improving overall service level lie in the following areas: planning capabilities, stability of parts supply, supplier collaboration, transformation management, information system capabilities, and supply chain visibility.

It is clear that the spare parts business will hold great strategic importance in the future. Deloitte advises that Chinese automotive companies consider how to integrate spare parts operations into overall corporate strategic planning as soon as possible in order to establish leading capabilities for such operations. Meanwhile, OEMs need to lay the foundation for SPM implementation involving their organization, people, systems, and data in order to take the lead in future market competition.

Market Trend: Spare parts business will become the key competition area

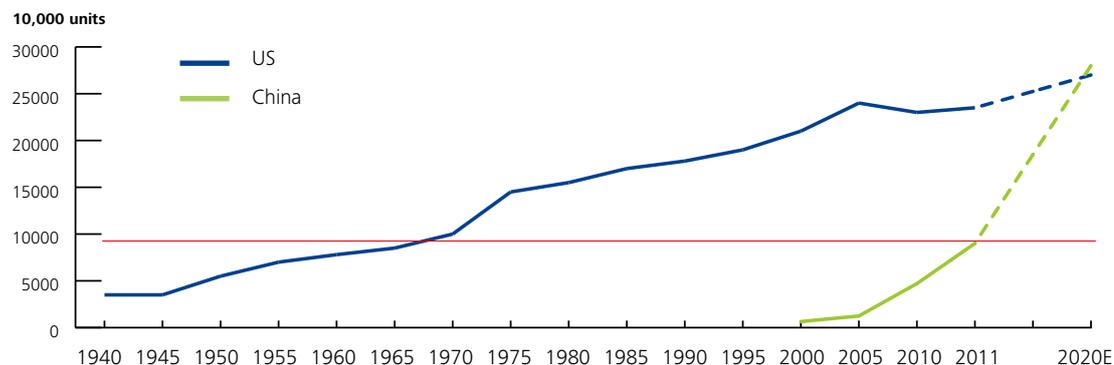
As China's automotive market matures, the potential of the after-sales market has started to be gradually realized. The spare parts business has become more strategically important and will become one of the key areas for future competition.

The spare parts business is considered the main driver to enhance customer satisfaction and generate repurchase opportunities: Spare parts operations is one of the key factors in ensuring favorable service levels for customers. As the proportion of additional sales and replacements has gradually increased, customers have begun paying more attention to the quality of after-sales services, which directly affect their purchase decisions. The importance of after-sales service and spare parts operations to overall automotive sales is becoming increasingly obvious.

Along with the rapid growth of the after-sales market, the spare parts business will soon become another major revenue source for OEMs: As the China auto market's Car Parc undergoes exponential growth and the market's average vehicle age rises, revenues contributed to OEMs by services and spare parts business are growing rapidly. Services and spare parts business will comprise a major new source of growth for Chinese OEMs.

Car Parc in China vs. the US Market

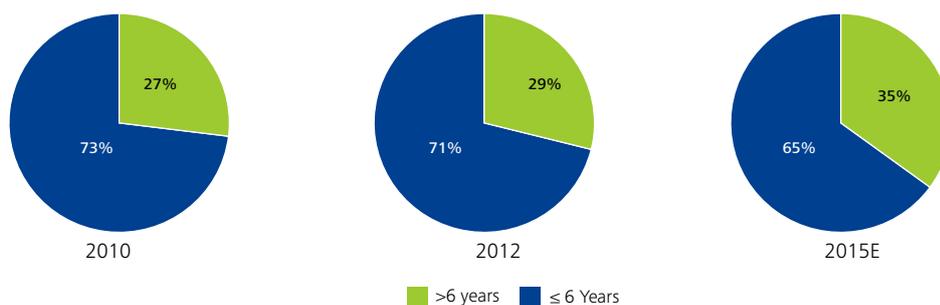
—In 2011, China's Car Parc was around 90 million, roughly equivalent to that of the US back in 1965. In 2020, this number is expected to reach 280 million, which may exceed that of the US.



Source: Automotive Aftermarket Industry Association

Evolution in Age of Vehicles in China Automotive Market

—In China automotive market, vehicles aged over 6 years (the critical age at which after-sales demand is triggered) accounted for around 27% in 2010. This number rose to 29% in 2012 and is expected to reach 35% by 2015.



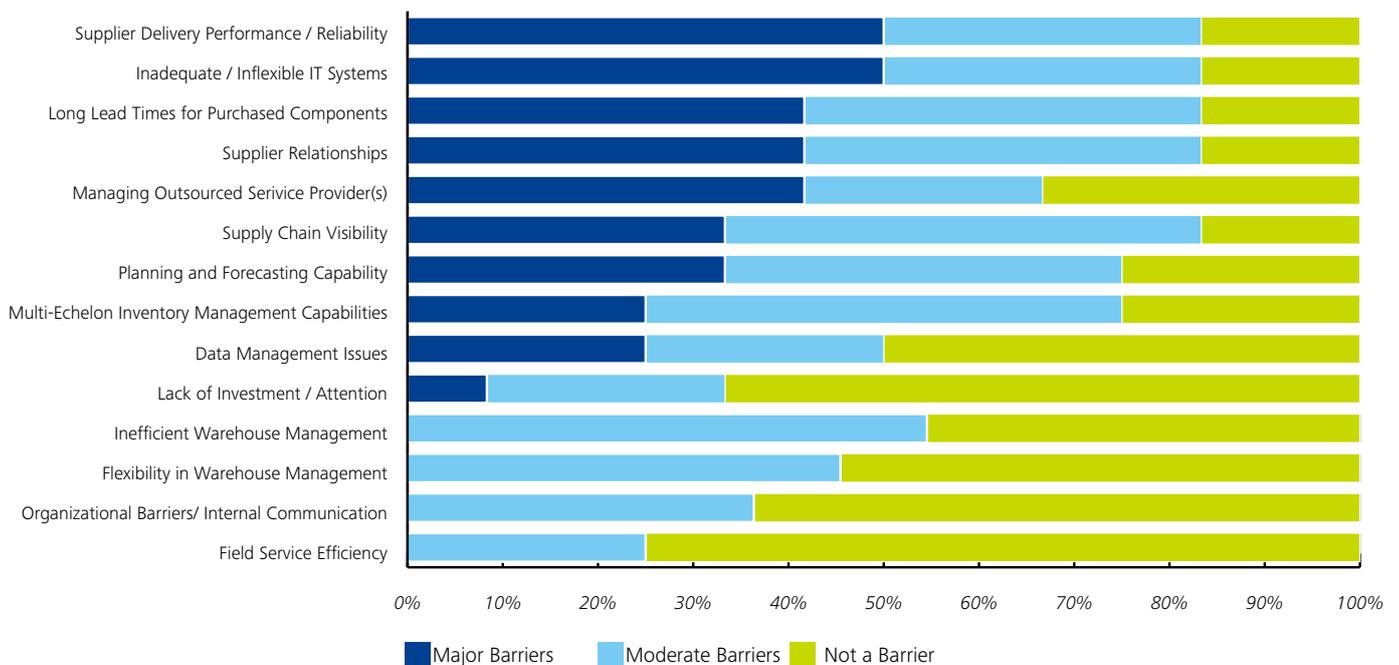
Source: Automotive Aftermarket Industry Association

More Complex Supply Chain Management: Spare parts management presents greater and unique challenges

Spare parts supply chain management is more complicated than that of finished products. The complexity of the parts business is generated by its own unique attributes. The life cycle of spare parts is longer than that of vehicles and the total number of SKUs is very huge. Additionally, the demand for parts is relatively unstable and difficult to forecast. All of the above pose enormous challenges to parts planning, purchasing, ordering, and logistics, among other operations.

Deloitte's survey indicates that most Chinese OEMs began to realize the importance of the spare parts business. Most managers in spare parts business area believe that factors such as investment, strategic focus, and organizational and internal communication do not constitute major obstacles to the continuous improvement of the parts business. On the other hand, they believe that the major barriers lie in planning capabilities, stability of parts supply, supplier collaboration, information systems, data management, and supply chain visibility.

Top Barriers to Service Excellence for Chinese OEMs



Source: Deloitte China Auto Industry Spare Parts Management Benchmark Survey

In terms of operating results of the parts business, Chinese OEMs' performance appears to be in line with those of OEMs in mature markets regardless of business size. However, SPM capabilities and performance vary widely among different OEMs. The biggest challenge we faced in conducting operational KPI benchmarking is that most OEMs have not yet fully established SPM KPI systems. Most KPIs have yet to be calculated, or the reliable data and tools to calculate such KPIs are unavailable. Additionally, an industry-wide SPM operational KPI system with the standardized definition and calculation formula for industry performance benchmark is still not available.

Spare Parts Management KPIs Benchmark – China vs. Global Auto industry

	China Average	China Best	World Average ¹	World Best ¹
Facing Fill Rate²	93%	98%	95%	97%
Annual Inventory Turns	3-4 turns	6-8 turns	3.6 turns	4.6 turns
Order to Delivery Lead Time	≤ 3 days: 60-70% ≤ 1 week: 100%	≤24 hours: 95%	≤24 hours: 17.5%	≤8 hours: 1% ≤24hours: 47.5%
Total Logistic Cost as a % of Sales³	7-8%	4-5%	8.8%	5.8%

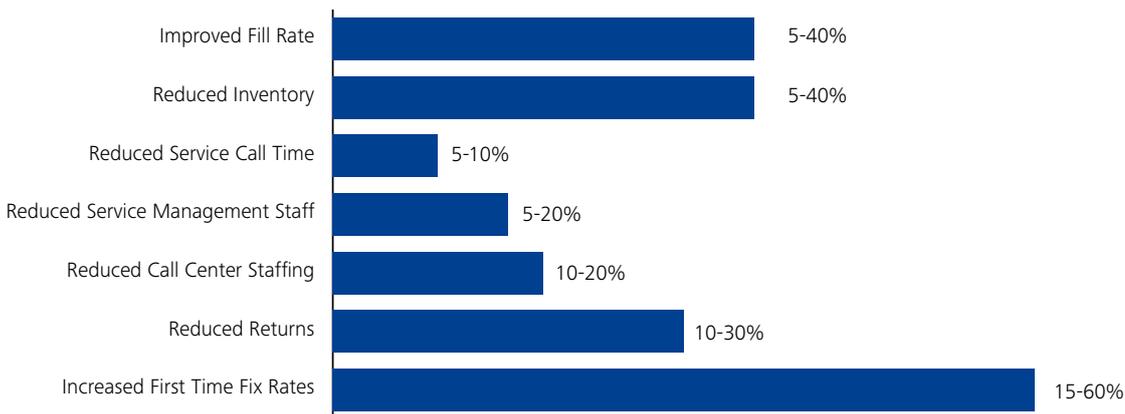
Note:

1. World average and world best data were referenced from Deloitte Global Service and Parts Management Benchmark Survey
2. Facing Fill Rate is the percentage of order lines which can be filled by facing warehouse. There are different definitions and calculation formulas for this KPI among the OEMs involved in this survey
3. Only outbound transportation cost and warehouse management cost are included in logistics cost, which is impacted by logistics operation model of most Chinese OEMs

Source: Deloitte China Auto Industry Spare Parts Management Benchmark Survey, Deloitte Global Service and Parts Management Benchmark Survey

In the world’s leading SPM practices, most OEMs have consistently paid considerable attention to spare parts business in its overall strategy plan and achieved continuous improvement and investment in terms of operating models, process and information systems. Deloitte Global Market Research indicates that return on investment from dollars spent on optimizing spare parts business can be sizeable, and there are significant benefits to other KPIs in addition to profitability.

Potential Operational Improvements from Spare Parts Management Optimization



Source: Deloitte Global Service and Parts Management Benchmark Survey

As China’s automotive market matures, the growth of vehicle sales will gradually cool to normal levels. As a key new growth opportunity and profit source for OEMs, the spare parts business is bound to attract more and more attention. How can Chinese OEMs re-examine the spare parts business to achieve continuous improvement in this sector?

Through close communication with major Chinese OEMs, Deloitte Consulting conducted in-depth research and analysis to draw and provide insights covering five key aspects--- strategy, network, planning, logistics and systems.



Aspect 1

Re-examining the Strategic Importance of the Spare Parts Business

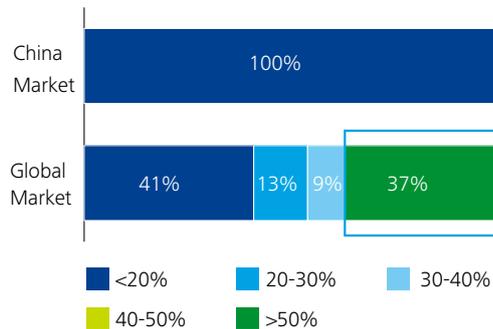
For OEMs in mature markets such as Europe and the US, the spare parts business has already become the most important source of revenue and profits. According to a global survey conducted by Deloitte, service and parts business on average account for more than 35% of total OEM revenues. For a third of OEMs, the revenue generated from their service and parts business even contributes more than 50% of total. In addition, profit margins for the spare parts business are usually higher than that of traditional vehicle sales. Deloitte also found out that in mature markets, profit margins for spare parts are 76% higher than that of the conventional finished product business. For 70% of the OEMs, the profit margin for spare parts business is more than 25%, and for 34% of the OEMs, the margin for parts business is even higher than 40%.

Compared with OEMs in mature markets, Chinese OEMs still consider finished vehicle sales as their main source of revenue, as service and spare parts businesses only account for a relatively small portion of its total sales. This survey indicates that for most of the domestic OEMs, the revenue from spare parts business only accounts for about 5%-10% of total (Chart 4). However spare part business revenue is growing fast. 80% of interviewed OEMs achieved more than 25% growth rate for their spare parts businesses, and their gross margin has also exceeded 20%, even more than 30% for some leading OEMs.

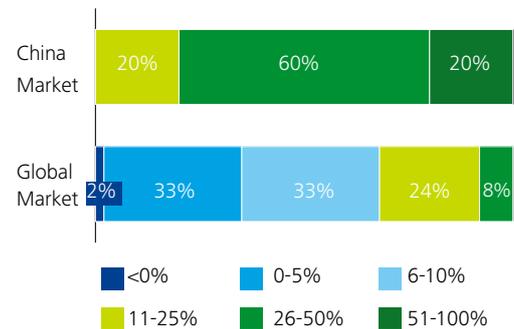
Revenue Share and Growth Rate of Spare Parts Business — China vs. Global Auto Industry

Distribution: Share of Spare Parts Business in Overall Revenue

10% for industry leaders and 5% for average in China market



Distribution: Spare Parts Business Growth Rate



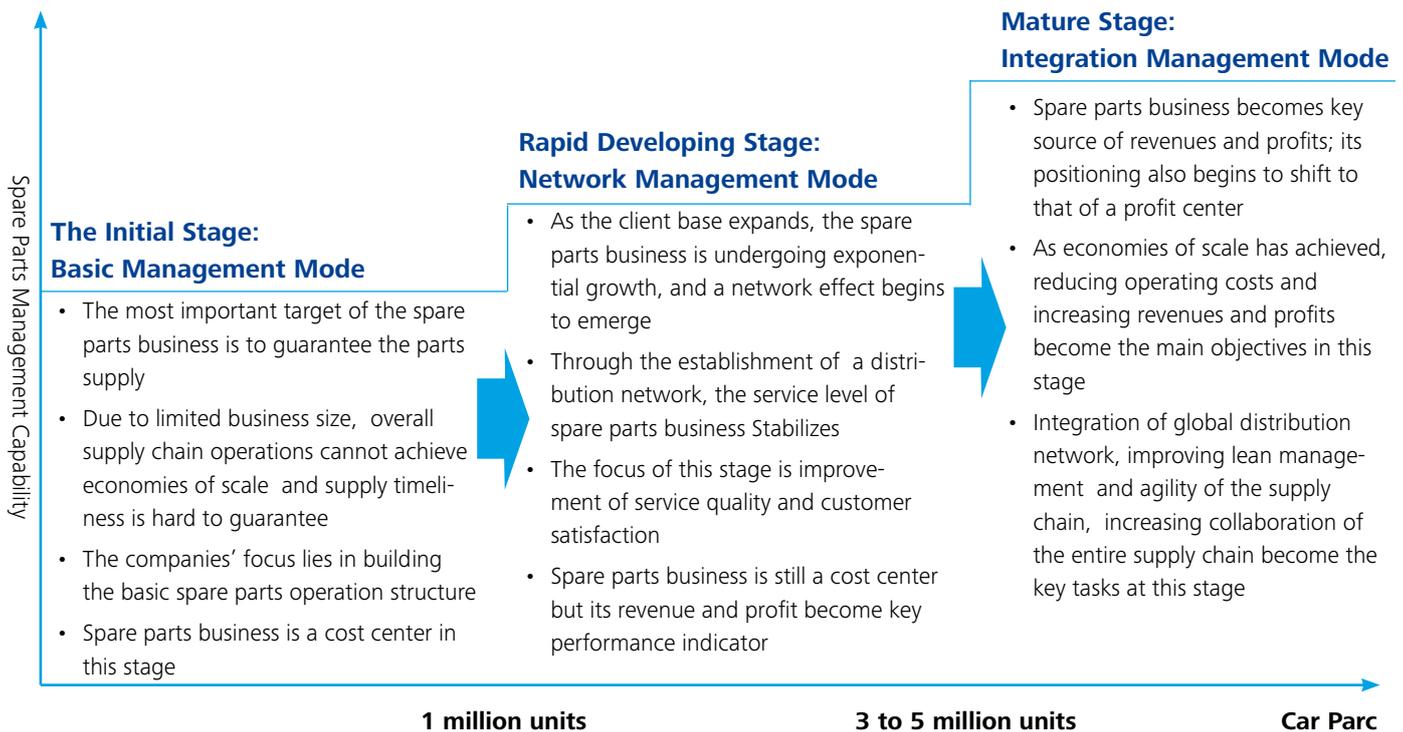
Source: Source: Deloitte China Auto Industry Spare Parts Management Benchmark Survey, Deloitte Global Service and Parts Management Benchmark Survey

Looking to the future, the great profit potential of the spare parts business will definitely make it another key source for domestic OEMs to improve their overall profitability. At the same time, the parts business is also strategically meaningful for OEMs to enhance their overall service standard and branding. The “last mile” to the customer where battles for customer loyalty are won or lost, the majority of companies are still unable to provide customers with excellent and cost-effective service. Overall, our analysis of the benchmark results suggests that customers are likely to get exactly what they want, at the right time and place, and that Today’s customers have more options and more information than ever before to prompt a switch to competitors’ products and services. Therefore, ensuring service excellence has become a critical factor to retaining customers.

In the global market, some OEMs have built the reputation of their brands and their business models on the back of excellence in service and parts management. For Lexus, the luxury-vehicle division of Toyota Motor Corporation, service excellence helped propel the upstart brand to market-share leadership in North America less than two decades after its launch in 1989. For Hyundai Motor Company and Kia Motors Corporation, the emerging automotive giants based in South Korea, spare parts management, through Hyundai Mobis’ spare parts Business, is an integral part of the corporate strategy. Currently, in mature markets, as many vehicles are sold with warranties of up to 10 years/100,000 miles, service and parts operations must function at the highest level of efficiency to avoid customer service problems and excessive warranty costs, and thereby sustain profitable growth.

As the strategic importance increases, Chinese OEMs are experiencing a critical stage of strategic repositioning of spare parts business. How to establish an appropriate business model with an optimal balance between service level, cost and profit has become an important topic for all OEMs in China. According to the experiences of leading OEMs in mature markets, their parts businesses all experienced certain common stages (initial growth, rapid development, maturity). Aligned with these different development stages, Spare parts management has also experienced transformation and upgrading in three modes: basic management mode, network management mode and integration management mode.

Three Stages of Spare Parts Business Management Mode



Currently, most domestic OEMs with proprietary brands have overall Car Parc of around one million, while some joint venture OEMs have exceeded 3 million. However, both of them are still in the first or second stage of the transformation and upgrading process. Re-examining the strategic positioning of the spare parts business and identifying its development mode in the future should be the top agenda item for all Chinese OEMs' executives. Deloitte's experience has consistently shown that Chinese OEMs should pay more attention to the following priorities when designing their spare parts business strategy.

- Achieve improvement in OTD lead time and service levels through establishment and continuous improvement of the distribution network.
- Establish an integrated and agile spare parts supply chain operation model to improve supply chain operation capabilities and achieve the optimal balance of service level, efficiency and cost.
- The cost and efficiency of spare parts business operations are closely related to the design of the product/service. Integrating Spare parts business into the overall business strategy, in particular achieving synergy between product/service innovation and customer life cycle management, fundamentally improves the spare parts business model. This is the future direction of development for the spare parts business.

Another issue closely connected with strategic positioning is the organization structure of spare parts business. According to the survey, the spare parts business has multiple organizational models. Interestingly, we discovered that although domestic OEMs have relatively low Car Parc and smaller spare parts business size, most of them have established independent spare parts subsidiaries to deal with parts sales and delivery. Additionally, there are measures in place to gauge profit and revenue performance. On the other hand, for joint venture OEMs with larger spare parts business size, the parts business is typically operated and managed by the

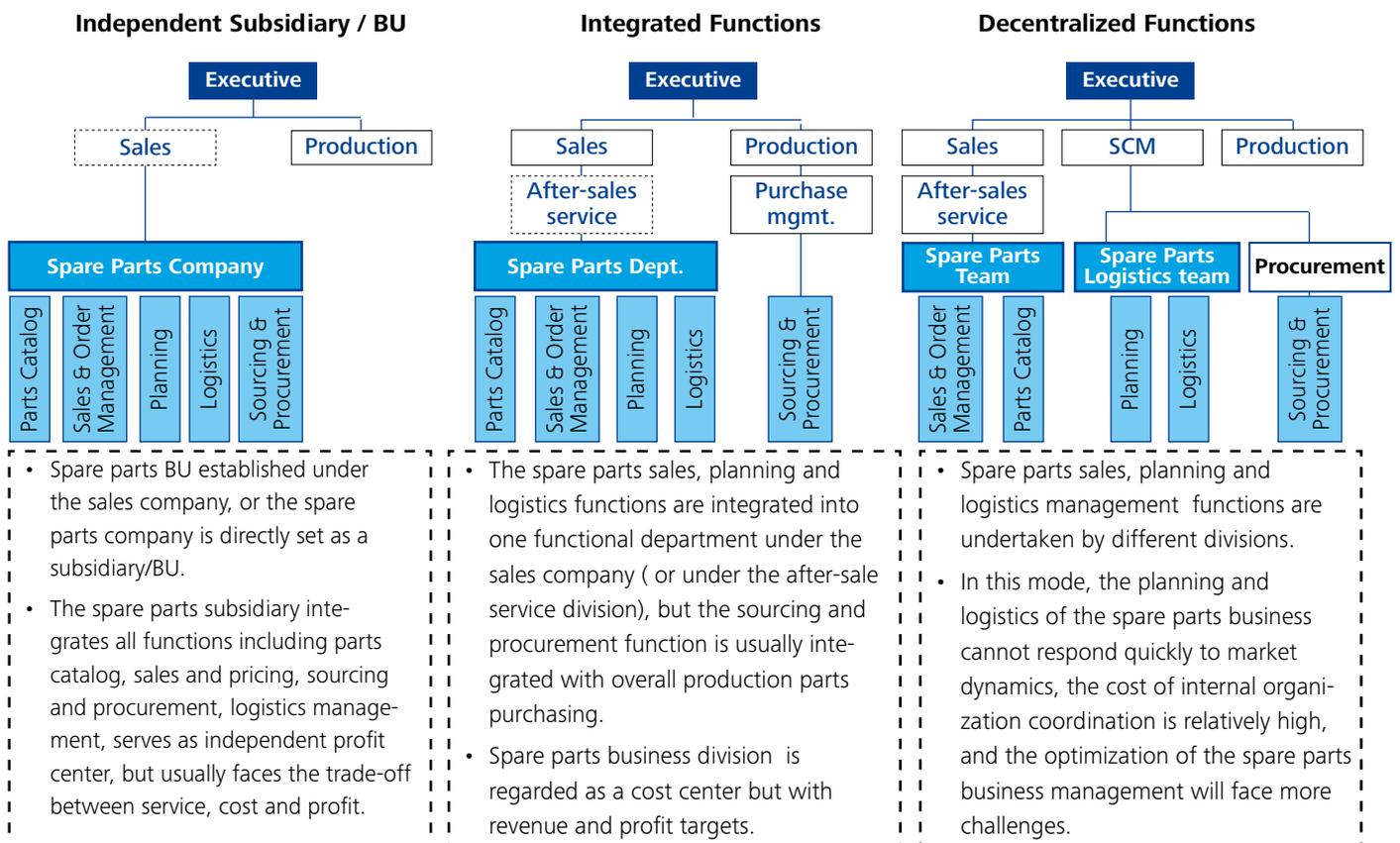
functional departments of the OEM's sales company or even by the spare parts division under the service department.

For most Chinese OEMs, the organizational structure for the spare parts business is not aligned with their strategic positioning and business model, which leads to confusion for management in terms of business positioning and internal collaboration.

Some domestic OEMs have established spare parts business subsidiaries, but they usually face a dilemma of choosing between service level, cost-efficiency and profitability. Most domestic OEMs have not achieved economies of scale and when considering supply chain management capability improvement, they try to ensure consistent delivery and high service levels while facing the pressure from revenue and profits targets as well. In this situation, some OEMs are adopting a "push" sales model which lacks accurate forecast and planning and a buy-out distribution model, maintaining relatively higher stock levels at dealers and buy-out warehouse to conceal supply chain operation problems.

OEMs which operate their spare parts business as an individual functional department also face coordination problems in the organization. For OEMs which adopt the function integration model, despite the fact that their spare parts department can develop spare parts procurement plan and communicate with suppliers, the sourcing and supplier management are usually managed with production parts by the purchasing department. This leads to great challenges for the spare parts department when it comes to collaborating effectively and efficiently with suppliers. Under the independent-function model, the planning and sales functionality of the parts business are under different functional departments. Therefore, parts planning cannot react rapidly and flexibly against market changes, and spare parts management optimization generates higher costs for coordination within the organization.

Multiple Organization Models for Spare Parts Business among Chinese OEMs



Note: The above organization charts are just for illustration, do not indicate any certain OEMs
 Source: Deloitte China Auto Industry Spare Parts Management Benchmark Survey

Deloitte's experience has consistently shown that there is no ideal one-size-fits-all organization structure model for all OEMs. The selection and adjustment of organization structure model should be aligned with the development stage, strategic positioning and business model of the spare parts business. Some OEMs need to re-examine their current organization model and consider what adjustments should be made to promote sustainable development of their spare parts business.

During the first stage of the spare parts business, economies of scale are still not in place. The parts business should be considered a cost center which mostly leverages the finished products supply chain management capabilities in terms of procurement and logistics functions to ensure timely parts supply and delivery. In order to lay a sound foundation for the future development of their spare parts business, OEMs should invest heavily in fundamental capabilities such as operation process, human resources, and IT systems.

As the size of the spare parts business expands, revenue generated from it will increase sharply, and its strategic position will change significantly. The management mode of spare parts business will begin to shift to network management mode and integrated management mode, with a focus on supply chain synergy and flexibility as well as a more integrated organization structure to meet future business development demands. Also, as an important source of revenue and profits, the spare parts business requires a more market-oriented organization model to support rapid business growth.

Globally, it is quite common for OEMs in mature markets to establish separate spare parts BUs or subsidiaries to operate and manage their spare parts business. For example, the spare parts units of Volkswagen and Ford are independent BUs, and those of Mobis of the Hyundai Group and Mopar of Chrysler are independent subsidiaries, which operate and manage the complete supply chain including sourcing and procurement, sales, planning and logistics.

Leading Practice: Mobis of Hyundai Group

Mobis, formerly the Hyundai Provision Industry Company, was founded in July 1977. At the time, it was the world's largest container manufacturer which was also involved in vehicle production and high-speed railway assembly. Since the 1990s, Mobis gradually transferred its 4WD vehicle manufacturing businesses, including Galloper and Santamo, to Hyundai Motor, and its railway business to KTX. Towards the end of 1999, Mobis began to produce a new type of chassis for Hyundai Motor. Since then, the company transformed itself to become a professional auto parts company. In November 2000, the Hyundai Provision Industry Company was renamed Mobis. The newly renamed company took over the spare parts businesses of Hyundai and Kia Motors to focus on spare part sales and exports and module parts manufacturing. It eventually became the largest professional auto parts company in South Korea.

Mobis built a complete spare parts supply system, to provide packaging, warehousing, purchasing, and sales and distribution services for aftermarket spare parts and accessories to Hyundai and Kia Motors.

Through centralized management of spare parts procurement, sales, and logistics, Mobis achieved end-to-end management of the entire spare parts supply chain. Additionally, Mobis signed exclusive supply agreements with upstream parts suppliers of Hyundai and Kia Motors. This allowed Mobis to make procurements at favorably negotiated prices, and ultimately achieve a supply and pricing monopoly on spare parts in the aftermarket. The higher pricing of its spare parts has ensured its high profitability in the parts business. At the same time, in order to improve the speed of its response to consumer demand, Mobis established a global distribution logistics network. This has allowed Mobis to successfully achieve an order fill rate of 95% and form a good reputation in the spare parts market. Meanwhile, since Hyundai and Kia have over 20 million vehicles worldwide and Mobis has been relatively profitable, even throughout the recent recession, Mobis has been able to sustain a stable income and thereby help to bolster the overall earnings of Hyundai and Kia Motors.



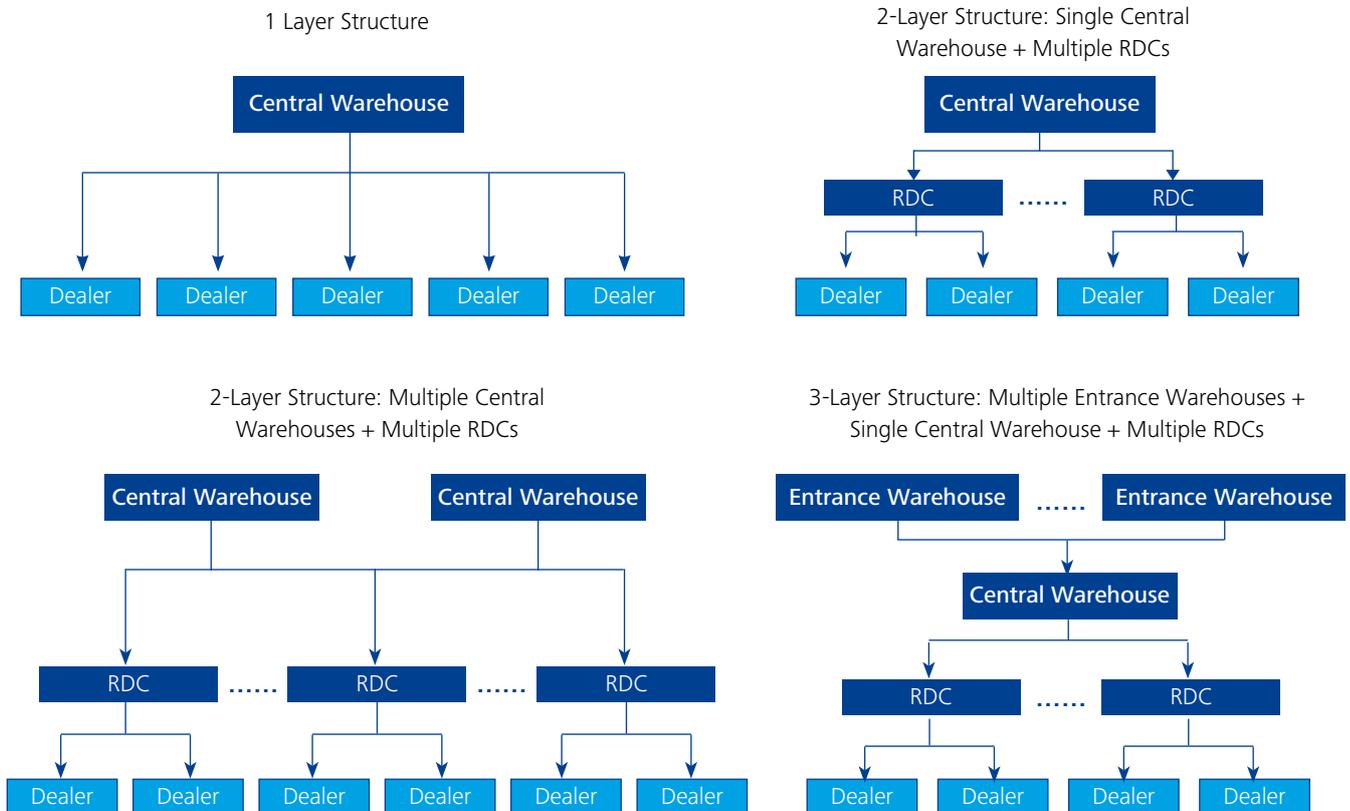
Aspect 2

Network Strategy and Distribution Model: Laying the Foundation

Both ends of the supply chain face multiple suppliers and clients (service stations / dealers). Since the spare parts business requires higher service levels, most OEMs have adopted a multi-layer network for spare parts distribution. Network structure determines the distribution flow of spare parts from the supplier to the client. Thus, network arrangement is a crucial factor for spare parts operations in achieving targeted service levels and cost effectiveness.

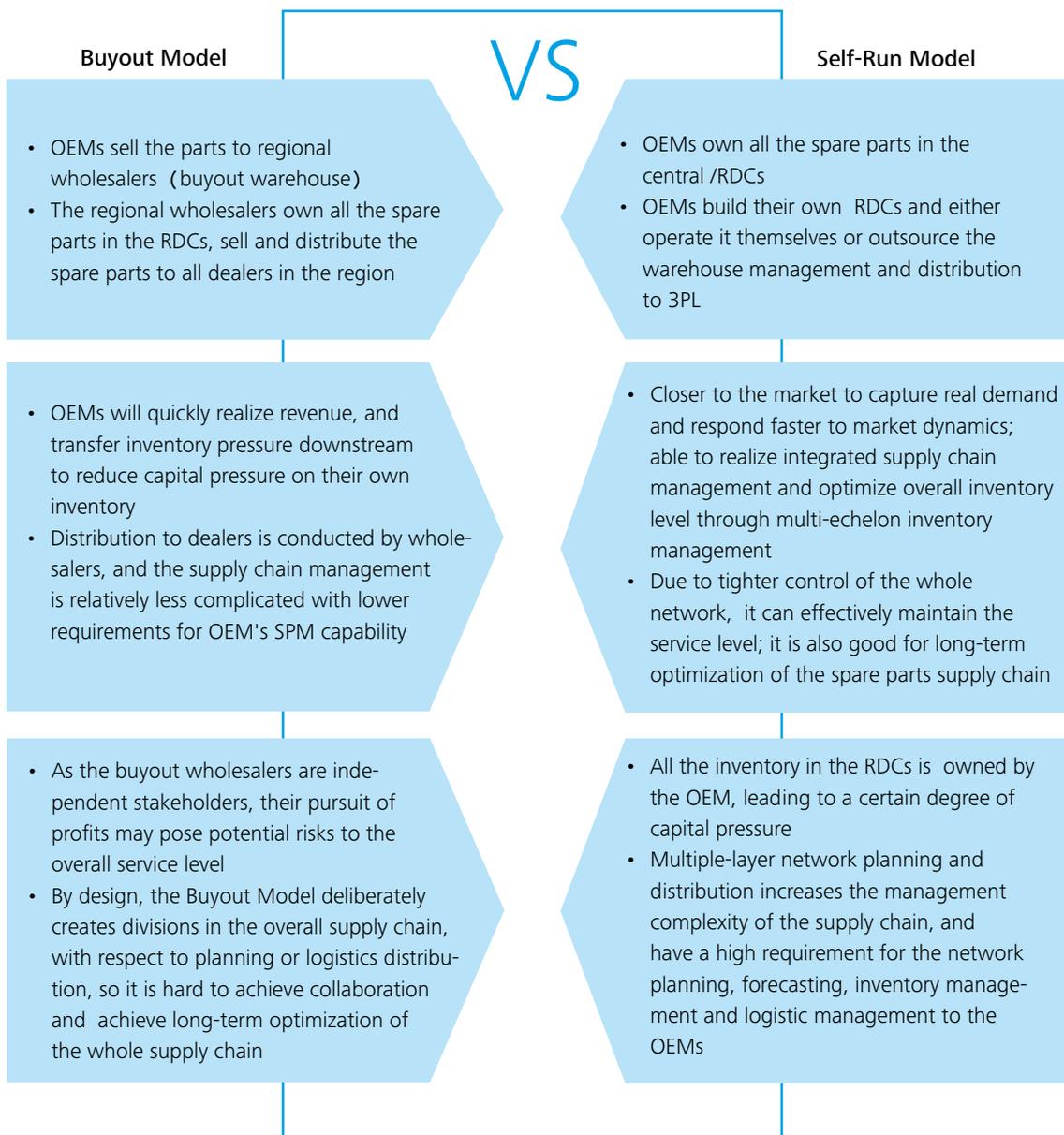
When developing new strategic initiatives, most OEMs have begun to pay more attention to the optimization and transformation of their distribution network. According to the survey, the current network for the majority of OEMs is that of a two-tier structure, which includes both the central warehouse and RDCs, and the total number of RDCs ranges from 4-18. A minority of small-scale OEMs still employs a single tier direct distribution model from the central warehouse, or use small RDCs to serve the entire network. This leads to a slow response speed to customer demand. Some other OEMs have established RDCs in accordance with wholesalers' locations or other historical reasons. Such OEMs usually face great challenges with parts planning and logistics operations, as the number of RDCs is excessive and the locations of RDCs are irrational due to a lack of systematic planning.

Distribution Network Structures among Chinese OEMs



For some domestic OEMs, the optimization of the current network structure is restricted by the existing distribution model. Currently, most Chinese OEMs use two distribution models—the buyout model and the self-run model. In the buyout model, the OEMs rely on big dealers or professional spare parts wholesalers to act as regional agents to sell and distribute spare parts in their respective regions. In the self-run model, the OEMs set up their own RDCs or hired 3PLs to establish RDCs to make regional distribution. According to this survey, most domestic OEMs employ the buyout model, while most joint-venture OEMs use the self-run model. Some companies adopt both, which means that they employ the buyout model in some regions for parts distribution, while in other regions they choose to make regional distribution using their own RDCs.

Spare Parts Distribution Models among Chinese OEMs



Deloitte believes that the self-run distribution model is the better long-term choice for most OEMs. The buyout model can meet a company's spare parts delivery and service demands for a certain period of time, but in the long run, there will be more participants in addition to the three major players (including supplier, OEM and dealer). This will increase collaboration costs in the supply chain and is not good for the long-term optimization of the entire supply chain in terms of network planning, demand forecasting, inventory management and logistics among other respects. On the other hand, OEMs which adopt the self-run model are closer to the market, allowing them to respond faster to market changes, achieve effective control of the entire supply chain, leverage the advantage of supply chain synergy, and realize continuous improvement of the supply chain. Thus, for most OEMs, transforming their network distribution model from buyout to self-run is the future trend. Some OEMs have already begun to analyze or even implement this transformation.

Meanwhile, it is important to note that the transformation challenge itself is tremendous. The shifting away from the buyout model will entail breaking some existing business relationships, especially those between OEMs and key dealers. The change of relationship will not only influence the spare parts business of an OEM, so it should be discussed under corporate strategy to identify opportunities and threats in terms of sales and service. The company should also think about its current SPM capability, especially whether it is ready to adopt the new distribution model, in terms of network planning, forecasting, inventory management and logistics, etc.

Considering the transformation of network distribution model, further optimization of the network planning is the second step. For some domestic OEMs, it is crucial for them to review and optimize the number and locations of the distribution center. Deloitte believes that, in the future, OEMs should leverage scientific tools, and consider various factors to develop their distribution network, and establish a long-term and dynamic network planning mechanism.

- Achieve optimal balance between strategy and mathematical analysis, and consider the future supply chain network structure and sales network, business strategy, business management model and strategic goals, especially the optimal balance between service level and cost efficiency.
- Leverage advanced network modeling and simulating tools instead of simple excel tool to lay a systematic and logical foundation for decision-making process, minimize investment risk, and enforce core strategies such as assets allocation.
- Establish highly-flexible network to be more adaptable to the future changes in business volume, sales and supplier network. Also, consider outsourcing non-core businesses, such as warehouse management, packaging, transportation, etc.
- Be ready for future changes. Establish a regular network evaluation and dynamic network planning mechanism to achieve continuous network improvement and be prepared for sudden market changes or crises.

Leading Practices: Ford US redesigned its spare parts distribution network

Ford US categorized their spare parts into fast moving items, bulk items and slow moving items according to distribution volume and part size. Ford re-planned the original spare parts network and reconstructed distribution center to include fast moving parts warehouse, bulk parts warehouse and slow moving parts warehouse. Ford also established a pushing deployment strategy and network to realize real-time docking operation and thereby improve the distribution efficiency and service level.

Before Re-planning	After Re-planning
<ul style="list-style-type: none"> • 1 central warehouse • 8 regional warehouse • Adopted pull deployment strategy with a safe inventory level, there are lots of transportation operations among the warehouses and outbound / inbound operation 	<ul style="list-style-type: none"> • Set up 23 outsourced packaging centers nationally based on the locations of suppliers, promote the "push deployment strategy", which means that the spare parts are transported directly to RDCs in cross docking model when they arrive and finish packaging in packaging center • Regional distribution center <ul style="list-style-type: none"> - 19 fast moving parts warehouses offer 24 hours delivery service - 3 bulk parts warehouses offer 48 hours delivery service - 1 slow moving parts warehouse

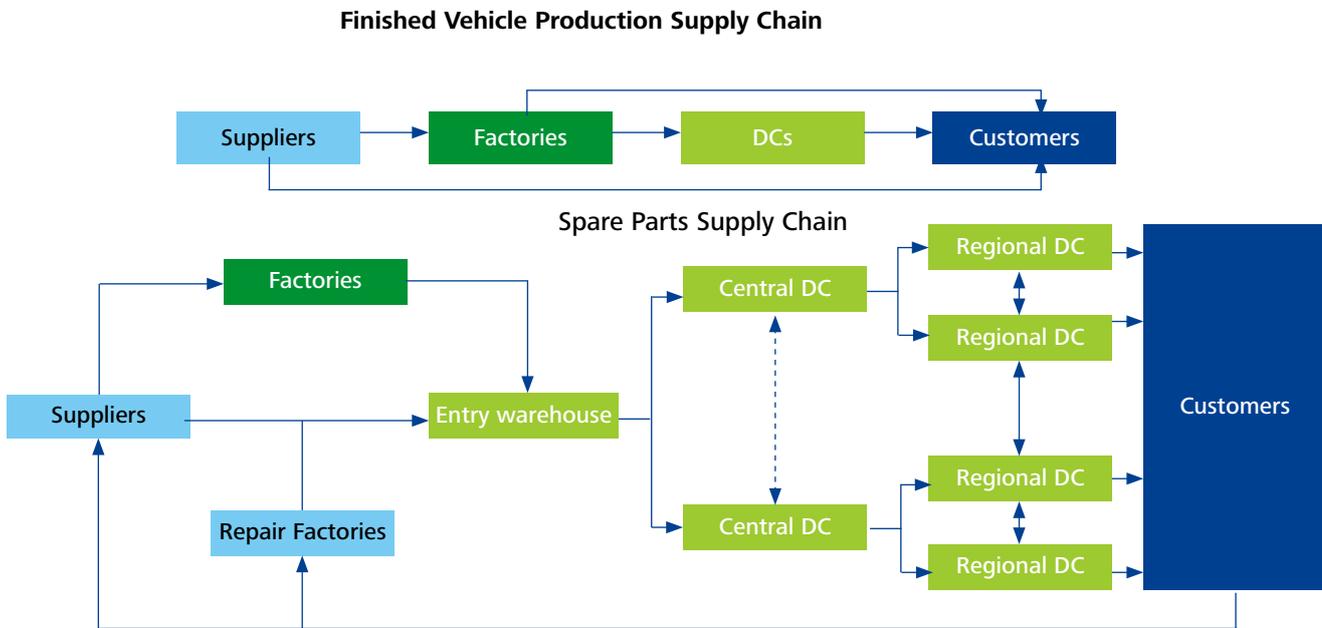


Aspect 3

Forecasting and Planning: the Key to Improving Efficiency and Service Levels

Similar to the vehicle supply chain, the importance of spare parts planning to SPM is self-evident. Goods flow is driven by planning, while the service levels, inventory costs, and logistics costs of the entire supply chain are influenced by planning management capabilities.

However, spare parts planning management faces more challenges. First of all, customers have higher requirements for service levels for spare parts business, as the parts business involves a huge number of part types. A single vehicle consists of 6,000 parts on average, and a new model will bring another 2,500-3,000 new part SKUs. According to the survey, most Chinese OEMs have more than 30,000 part SKUs. Secondly, the quantity, size and price of the demand vary significantly. Also, the planning management of the spare parts business is dependent upon demands of the entire network, so the inventory management must take central warehouses, RDCs as well as suppliers and dealers into consideration. Deployment plan is based on network structure and the planned distribution network is far more complicated than that of the typical supply chain. In SPM, multiple distribution networks, horizontal movement, and reproduction are all common occurrences.



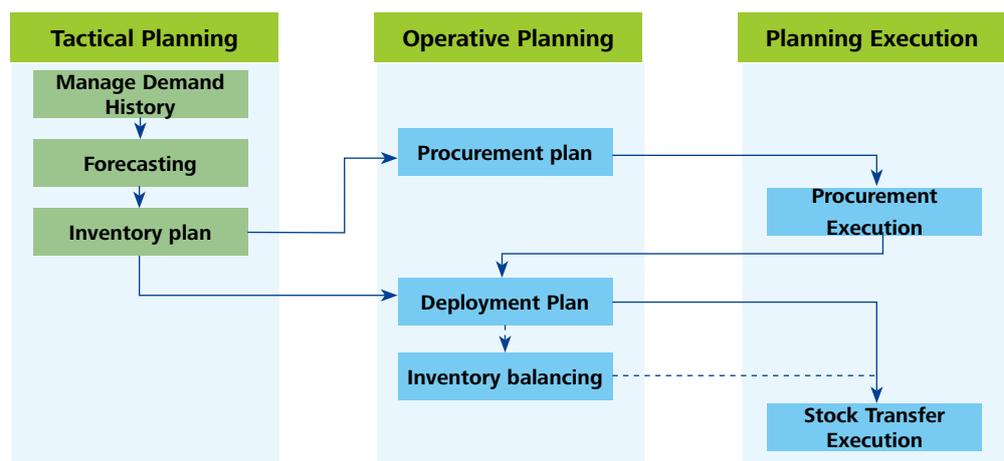
According to the survey, most domestic automotive companies consider planning and forecasting capabilities, multi-echelon inventory management capabilities as top barriers to overall SPM improvement. Generally speaking, domestic OEMs are still in the initial stage of the spare parts planning, facing multiple problems, including ignoring forecasting, extensive inventory management, and lack of integration in planning along the entire supply chain.

- **"Replacement of forecasting with historical demand data"**: most OEMs have not established independent forecasting functions or processes yet. The forecasting is made simply based on the average or weighted moving average number calculated with data from the past three or six months. Forecasting of some OEMs is still conducted manually and relies on planners' personal experiences. The lack of systematic and scientific methodologies causes lower forecasting accuracy. Additionally, domestic OEMs face the problem that most historical data is of low quality. Since most OEMs have not established demand history data management processes, the historical data used for forecasting is affected by dealers' abnormal ordering behaviors and other accidental situations, this renders true demand difficult to gauge and lowers forecast accuracy.

- **"Extensive inventory management"**: most OEMs use a blunt, one-size-fits-all approach to inventory management instead of a dynamic and refined one. The inventory management system on the parts level has yet to be established, and the safety stock and EOQ have not actually been applied in practice to planning management. The calculation of inventory plan is made based on "experience" or "perception" instead of service level, lead time and demand fluctuation.
- **"No integration in supply chain planning"**: most OEMs have not established multi-echelon inventory management systems. The spare parts planning management is conducted on the central warehouse and RDC level or even only conducted on the central warehouse level, without integration with the supplier plan, dealer inventory management and ordering management. For OEMs adopting the buyout model, the spare parts supply chain usually involves four planning parties including the supplier, OEM, buyout RDC/whole seller and dealer, resulting in poor visibility with regards to the supply chain information and inefficient synergy. In the case of asymmetric information, every party making plans from their own viewpoint leads to an aggravating bullwhip effect in the entire planning management resulting in increased inventory on each level and overall inventory inefficiency.

Deloitte believes that **Chinese OEMs should first take action to define the spare parts planning management structure**. The spare parts planning management can be divided into three levels: Tactical planning, operative planning and planning execution.

- Tactical planning is determining stocking or destocking and inventory level for each site of the distribution network. This mainly consists of historical demand management, demand forecasting and inventory planning management.
- Operative planning is determining the real goods flow, including the flow from suppliers to central warehouses and from central warehouses to RDCs. Therefore, operational planning consists of three parts: procurement plan, deployment plan and inventory balancing
- Planning execution comes after the operative planning, including procurement execution and stock transfer execution. The lead times of procurement and stock transfer are key inputs to inventory planning. Short and stable lead time will effectively reduce the inventory levels of each site of the whole network.



After clarifying the planning management structure, Chinese OEMs need to establish or introduce scientific methodologies and tools for forecasting, inventory management and deployment planning.

- Collaborate with dealers to achieve order management and improve demand history data quality through reasonable order classification and order management, dealers' ordering behavior management, and dealer inventory management.
- Gradually establish a scientific forecasting methodology, adopt a differentiated forecasting model based on the characteristics of parts demanding, and develop systematic forecasting methods and accumulate historical data for phase-in and phase-out parts based on parts life cycle.
- Establish precise and efficient multiple-echelon inventory management capability
- Strengthen the planning collaborative with suppliers and supplier management; achieve continuous improvement in supplier delivery behaviors through collaborative planning, information sharing and visualization, and supplier performance management among other means.
- Achieve effective planning collaboration with dealer in terms of inventory management and order management, to improve forecasting accuracy and further develop capability to manage overall network inventory.

Leading Practice: Ford improved its parts planning management capabilities through SPP implementation project

In 2002, Ford, Caterpillar, SAP and Deloitte made joint efforts to establish a 4-party alliance to develop new service parts supply chain management solutions, including planning management, inventory management, CRM and other functional modules. Ford expected to replace its decentralized legacy spare parts system with newly developed and integrated system to handle the planning and logistics along the parts supply chain efficiently, further promoting the establishment of a globalized supply chain and logistics platform.

In 2007, Ford established the globalized business process templates based on its business characteristics and first rolled out SPP in Ford Europe. Today, all functions have gone live in all European countries. In the European market, Ford has 360,000 parts, 1,500 suppliers, 2,500 dealers and 22 warehouses. The business scale and complexity have posed big challenges to the project.

With the help of the new SPP system, Ford has effectively improved its forecasting accuracy and realized fully synchronized integration planning and real time monitoring of its supply chain. The project results were as the following:

- Overall inventory level— reduced 15%
- Obsolescence – reduced 10%
- Referral Costs— reduced 10%
- Local Fill Rates— increased 0.5%
- Forecasting accuracy – increased 20%



Aspect 4

Spare Parts Logistics Management: Enabling Stability and Agility of the Supply Chain

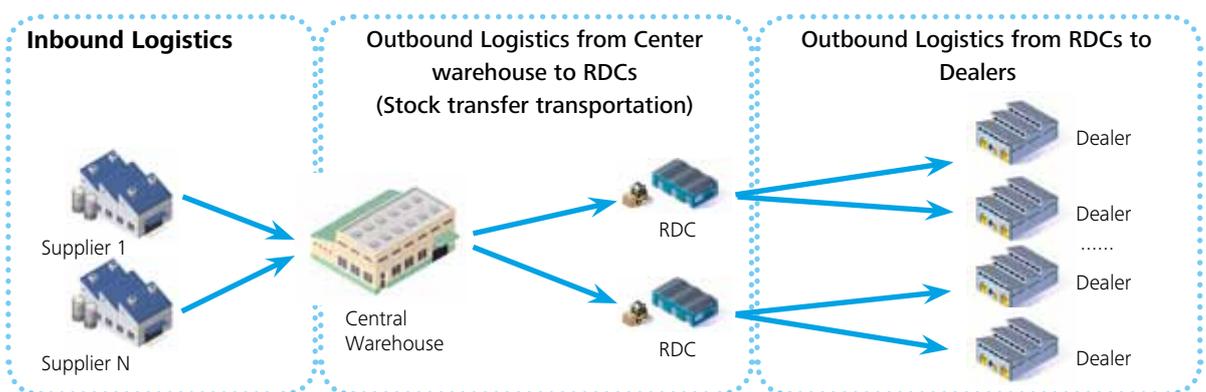
OEMs can improve their overall planning and management capabilities by improving forecasting accuracy and leveraging automated inventory planning tools. However, considering the possible deviation, certain risks and limitations cannot be avoided if we solely rely on spare parts planning. Toyota's continuous efforts in promoting zero inventory management and the JIT model provides remarkable insights. The stability and agility of the supply chain is another area to be considered for future spare parts supply chain improvement. The stability of the supply chain can be shown in leveling delivery lead time on each site of the whole network. The agility requires short delivery lead time among the distribution network, which means the forecasting time for each planning node will be shortened greatly and market response speed of the plan will be accelerated. Therefore, the accuracy and reliability of the parts plan will be improved and overall service level will be further improved.

It is clear that the efficiency improvement of spare parts logistics management plays a critical role in the stability and agility of the supply chain. Spare Parts logistics mainly includes transportation and warehouse management. According to the survey, warehouse management is not considered as the key barrier to SPM improvement by most OEMs. The overall distribution transportation, especially the inbound logistics, and 3PL management are considered as the major problems for OEMs.

Regarding suppliers, central warehouse, RDC and dealers, the spare parts logistics can be divided into inbound logistics, outbound logistics from central warehouse to RDC and outbound logistics from RDC to dealer.

Most Chinese OEMs' spare parts inbound logistics adopt the similar operation model with production parts supply, which means that the suppliers undertake logistics operation to deliver parts to OEMs' warehouses. Most OEMs' spare parts inbound transportation is shared with production parts inbound logistics or takes LTL mode. The time and quality of the logistics cannot be guaranteed in these modes, and it is difficult for OEMs to conduct real-time monitoring. 50% of OEMs in the survey fail to set the on-time delivery rate as a fixed KPI and only 25% of OEMs keep on-time delivery rate over 90%. Some OEMs have adopted the Milk Run mode or began to pilot the mode, but various challenges still exist. From Deloitte's perspective, the Milk Run mode cannot be successfully implemented without some preconditions, including splitting the logistics cost from parts purchase prices, effective collaboration between the purchasing plan and supplier production plan, the lean logistics capabilities of 3PLs, and standardization of parts packing, logistics equipment and transportation vehicles among others. Especially under the current circumstances in which most OEMs have a combined sourcing and procurement between production parts and spare parts, the independent implementation of the Milk Run mode for the spare parts business is nearly impossible. Moreover, OEMs may need to prepare for rising logistics costs after adopting this mode in a certain period of time. Therefore, OEMs need to clarify the strategic objectives for optimization before adopting the new model and get fully prepared for purchase, planning, logistics, and standardization. Hasty action is discouraged.

Common Spare Parts Logistics Model Adopted by Most Chinese OEMs



Feature	Logistics is undertaken by suppliers. OEMs have poor control over logistics in this section	Outsource transportation to 3PL and the logistics is under control with operation efficiency	RDCs are responsible for the transportation to dealers. Most RDCs adopt the LTL model considering the small quantity, so the time and service quality is hard to guarantee. The logistics performance is unclear due to the missing of real-time transportation monitoring
KPI	On-time delivery rate (not assessed)	On-time delivery rate (Over 95%)	On-time delivery rate (unclear real level)

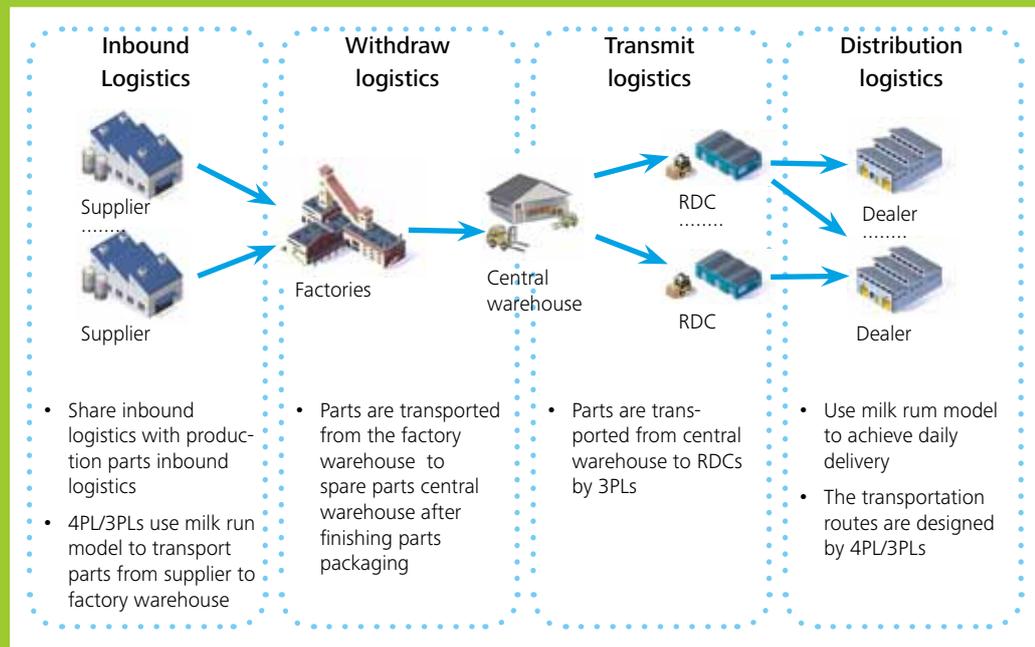
At present, outbound logistics from central warehouse to RDC is well managed among various OEMs. All OEMs have use 3PLs to outsource logistics operation for stock transfer. Outsourcing to one or several 3PLs are common practices for most OEMs. Generally speaking, OEMs have strong control and visibility with regards to logistics operation from central warehouse to RDC, and the efficiency and quality of transportation can be guaranteed.

Outbound logistics from RDC to dealer is another logistics blind spot. For most OEMs, the regional distribution centers directly outsource the order delivery transportation to local carriers, resulting in weak visibility and control on the operation. Due to the small quantity, LTL transportation is the common practice. More transportation shifts would happen and result in poor delivery efficiency and quality. It is even hard for them to collect actual on-time delivery performance. However, some OEMs have realized effective management and control over this section by outsourcing the operation to capable 3PLs. Leveraging their route planning and fixed batch delivery to adopt milk run mode to realize daily parts delivery to dealers, these OEMs improve the distribution efficiency and service levels remarkably.

In our opinion, the Milk Run delivery mode enables TL transportation and ensures the efficiency, quality and control of logistics in this section. However, the adoption of this mode requires a series of prerequisites as well, including the stability of dealer orders, the strong route planning capability of 3PL, standardization of parts transportation packaging, logistics equipment and vehicles, 3PLs' effective control over carriers. Also, the selection of logistics mode should be considered based on overall network and dealers' regional distribution to achieve best balance of service level and logistics costs.

Leading Practice: A Chinese OEM realized whole process control on its spare parts logistics operation

This OEM took the leading position in the spare parts logistics operation. It outsourced three sections of logistics operation to its 4PL/3PL. It effectively controlled the "inbound logistics" and "outbound logistics" and greatly enhanced the overall efficiency of logistics operation, especially with regards to on-time delivery performance. At present, over 90% of order delivery allows for 24 hours delivery with on-time delivery rate reaching 95%, which is regarded as the industry - leading practice.





Aspect 5

Cutting-edge Information System: Leapfrogging Through Technology Maturity



The information system becomes more and more important. Without sufficient technology support it will be increasingly difficult, if not impossible, to manage and optimize the service business as customer requirements increase and the service business grows more complex. Now, the IT systems for the SPM business, including demand planning and forecasting, warehouse management, transportation management, CRM, and product data management, are maturing rapidly and can now support most of the requirements of even the world's largest and most complex service businesses. But from our research in the global and domestic market, the number of OEMs which can effectively use their IT system in SPM is relatively small. However, some the global leading companies, such as Ford, Chrysler, Rolls-Royce and General Motors have been capitalizing on technology system deployment and upgrading.

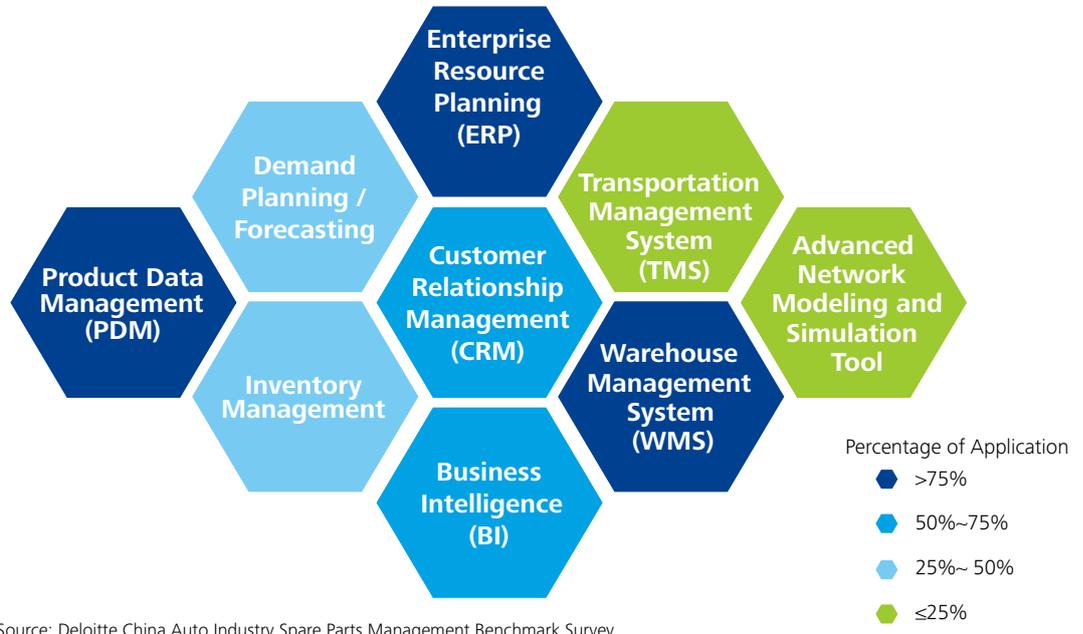
Leading Practice: Caterpillar is improving the service level and increasing supply chain visibility through continuous process optimization and IT system implementation

As far back as the 1970s, Caterpillar built a central global database for tracking inventory across its network, initially with a focus on parts originating from Caterpillar's central distribution centers. In 2002, the system was extended to include parts obtained locally to ensure global visibility to all parts in the distribution network. With more than 600,000 spare parts and components, products that often need service for 40 years or longer, and complex global flows of parts and information, no improvement comes easy. But visibility provides a cornerstone to make it happen. With the benefit of this improved visibility, together with better processes and better technologies, Caterpillar has been able to reduce its service parts inventories by half while improving its already highly regarded customer service since the late 1980s. Caterpillar can fill and ship an order in 24 hours or less 99.7 percent of the time. For Caterpillar, customer service levels rate as the top factor in generating repeat business. In addition, these improvements are saving the company in excess of US\$460 million annually.

Despite impressive results to date, Caterpillar is not resting on its laurels. Recognizing that its core competency is in supply chain management and logistics, and not in software development, the company is developing its next-generation global service and parts management system in joint collaboration with SAP, Ford Motor Company, and Deloitte to develop a new generation of SPM system, including SPP, EWM and CRM. Through the implementation of SPP and EWM, Caterpillar has now realized the integration of its global delivery network.

Most Chinese OEMs have completed the basic SPM system implementation including ERP and product data management system and are continuing to update their warehouse management system. However, they are still at a lower level of information system application with respect to forecasting, inventory planning and transportation management. About 80% of the companies have implemented the ERP system, warehouse management system, and product data management system, while more than 50% of the companies have not yet offered systematic support to the functions of forecasting and planning, inventory management. And few companies have implemented or plan to implement in the fields of advanced network modeling, simulative tools and transportation management.

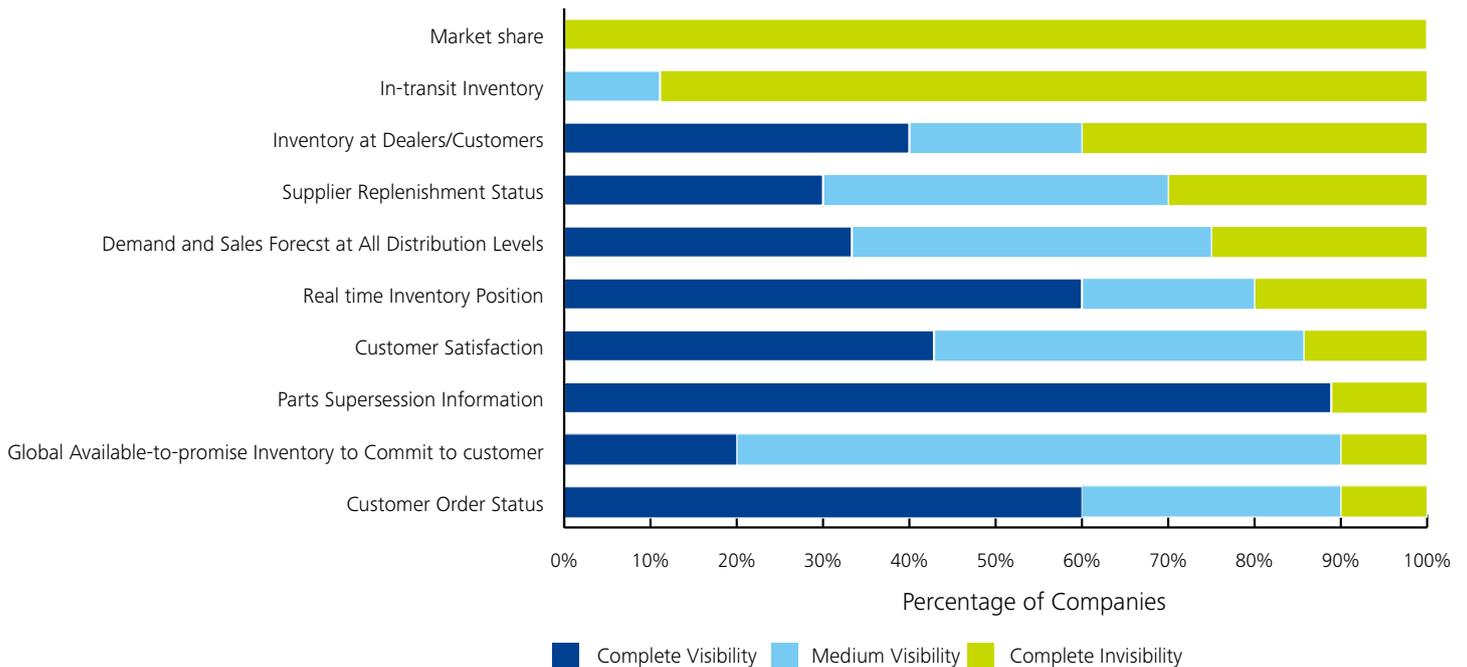
Chinese OEMs' Information System Application Status in Spare Parts Management Area



Source: Deloitte China Auto Industry Spare Parts Management Benchmark Survey

As Most of the OEMs have implemented a basic ERP system, warehouse management system and product data management system, the visibility of basic product master data throughout the entire supply chain is relatively high. However, the information visibility for suppliers, dealers, in-transit inventory is quite lower. As we know that the information visibility of the entire supply chain is the very foundation to supply chain planning collaboration, this revealed that most OEMs still lack effective system tools to achieve supply chain collaboration.

Information Visibility of Spare Parts Management among Chinese OEMs



Source: Deloitte China Auto Industry Spare Parts Management Benchmark Survey

Deloitte believes that according to the IT implementation status of the Chinese OEMs, there would be several key initiatives for Chinese OEMs to enhance their information technology application level, such as upgrading current ERP and data management (especially in the order processing and supplier collaboration area), improving supply chain visibility and collaboration, implementing new warehouse management system, initiating demand forecasting, inventory management system implementation.

Leading Practice: Hyundai Mobis's Spare Parts Central Distribution Center in Asan

Hyundai Motor Company and Kia Motors Corporation are selling their passenger vehicles with warranties of up to 10 years/100,000 miles in key markets around the world. To do this cost effectively, not only must the cars be of high quality, but the service and parts operations must operate at the highest levels of efficiency. Hyundai Mobis' Service Parts Sales Business is responsible for supplying service parts to Hyundai and Kia Motors vehicles worldwide. This involves stocking more than 890,000 parts for 137 vehicle types. It has built a US\$55 million, 2.2 million square-foot spare parts center in Asan, south of Seoul, to help do this more effectively and support its global distribution network. The center is piloting the use of item-level radio-frequency identification (RFID) tagging coupled with a central computer system using artificial intelligence for managing and optimizing the spare parts business. Customers can, in real time, remotely track the status of the shipment at any time between order and delivery.

According to Park Jeong-in, former CEO of Hyundai Mobis, the new facility will play a key role in the company's global supply network: "With the Asan center, we will be able to provide improved service for our customers in the United States, China and other markets in the world, as well as those in South Korea." Capturing a larger share of the servicing of Hyundai and Kia's more than 24 million vehicles in operation worldwide is a crucial part of the growth strategy

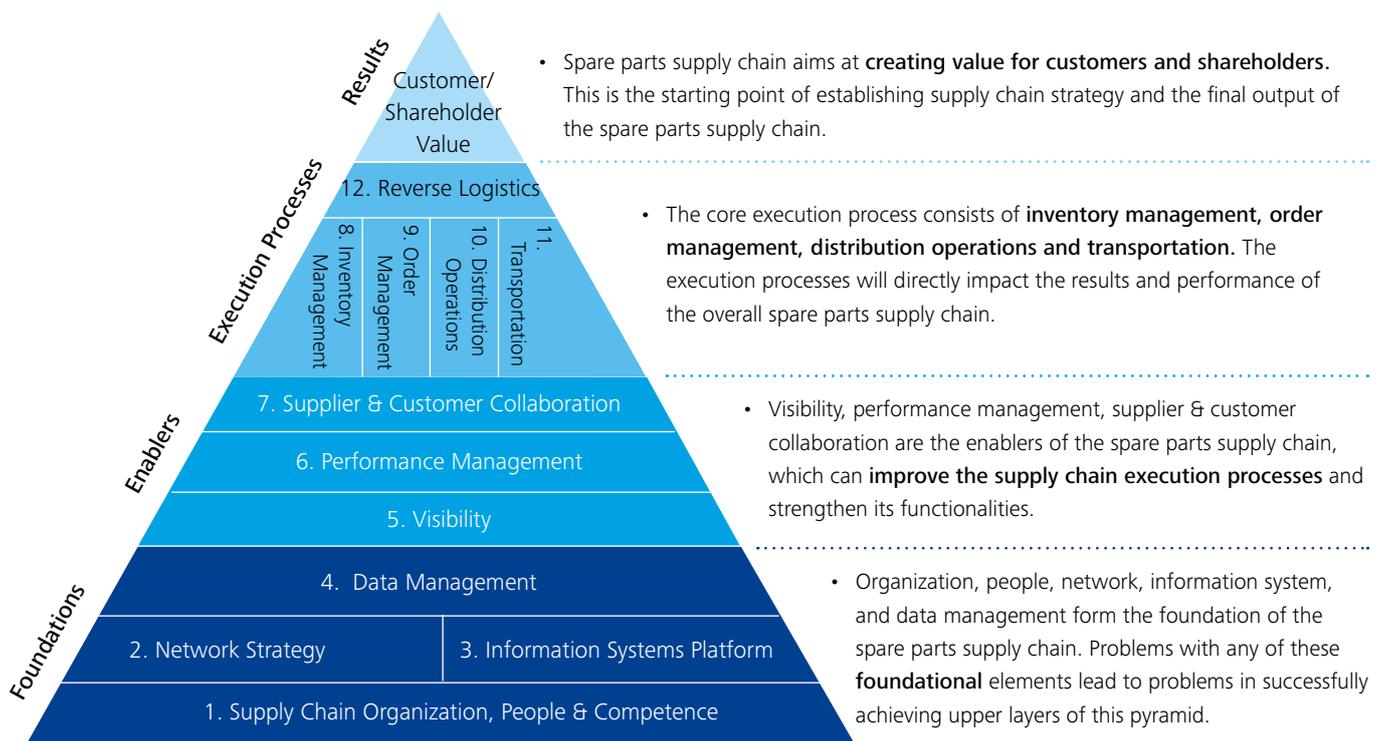
When promoting the information system implementation for spare parts business, OEMs also need to pay attention to the risks that arise from the implementation of new systems, focus on overall IT planning as well as business process optimization and preparation work before implementing a new system. Prior to launching the new system, OEMs should clearly define the function of each module and the internal relationship of functions and processes. Also, dedicated and professional teams should be in place to support the overall design of the system and the implementation in each phase. OEMs should consider another round of IT planning to establish a new system structure in order to achieve effective support of parts business improvement.



Conclusion: Driving Long-Term Optimization of the Spare Part Management

With profitability and growth levels far exceeding the main business in many cases, it is abundantly clear that the service revolution in global manufacturing is well underway. For most manufacturers, it is now a matter of effectively embracing the service revolution or risking being left behind.

Based on our global experience on SPM improvement and optimization for various leading companies, Deloitte has developed a spare parts supply chain management framework, which lists 12 key capabilities for spare parts management.



Based on this framework, companies can identify many opportunities for operation optimization and reform in the current spare parts business. In our past practice, this framework has helped many of our global clients to achieve significant improvements to their Spare parts businesses.

Deloitte believes that Chinese OEMs should consider how to integrate the spare parts business into the overall company strategic plan, how to establish leading operational capabilities in their spare parts business, and how to develop an implementation foundation in terms of organizational structure, talents, systems, and data management. Deloitte also hopes to leverage its rich experience on global SPM consulting area in the past decades to help more Chinese OEMs to improve their SPM capabilities and realize consistent value growth of the spare parts businesses.

Introduction to Deloitte Consulting Supplier Chain Management Service

Supply Chain Management is one of the largest and leading service areas of Deloitte Consulting. According to Kennedy's Global Consulting Industry Report, Deloitte's business revenue from supply chain management consulting has been number 1 globally for five years in a row. In China, Deloitte Consulting has provided supply-chain related consulting services to enterprises in various industries since 2002, and has now established a leading position in the supply chain consulting market, especially in the field of logistics and SPM.

Deloitte Service Scope for Supply Chain Management

Sourcing and Procurement Service	Supply Chain Planning Management	Logistics Management	Aftermarket SPM Optimization
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Lucy Feng

Associate Director, S&O
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Deloitte consulting has over 1200 bilingual advisory professionals and consultants in five offices locates in Beijing, Shanghai, Shenzhen, Hong Kong and Harbin and provides high-quality and industry specific professional services throughout the whole value chain.

Striving to enhance the value of the client, we provide comprehensive solutions throughout the value chain, covering all aspects including Strategy & Operation, Human Capital, and Information Technology. We persist in the concept of "developing with client" and value the actual implementation of planning and process design, and aim to establish long-term and collaborative relationship.

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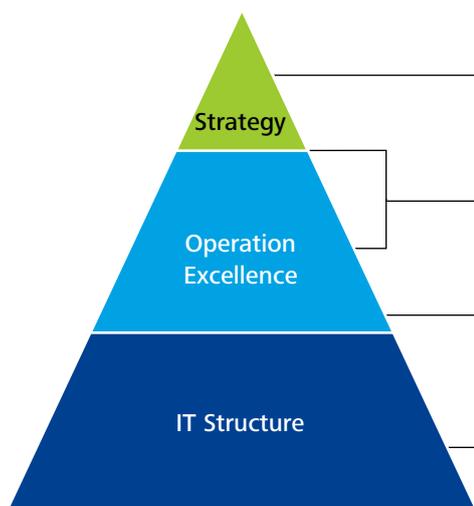
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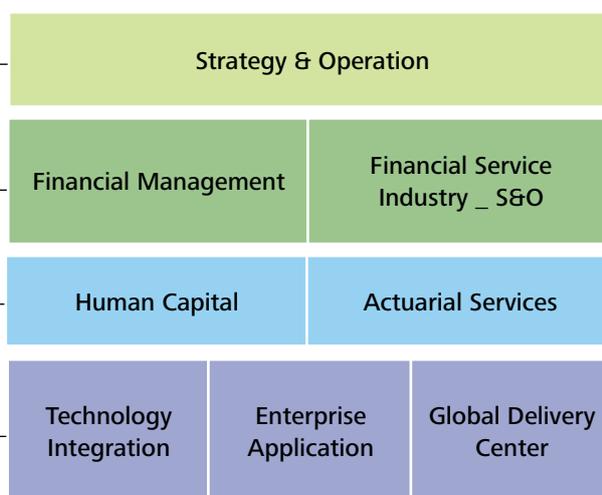
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Consulting Magazine	Best Employers	#6
Kennedy	Human Capital Transformation Service	#1
Kennedy	Life Sciences & Health Care	#1
Verdantix	Continuous Development	Leader
Kennedy	Human Capital	#1
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