Transforming Shipboard Service

Holistic Strategy Reorganizes Product-Service Integration

By Hans Ottosen • Jimmy Grewal

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Modern manufacturing, distribution and service companies around the world are embracing "servitization" strategies to develop and deploy integrated product-service solutions. In a servitized business model, the concept of integrated product and service permeates all aspects of a company's business, including product architecture, standardization of parts and processes, quality control, worldwide distribution, product maintenance and repairs, spare-parts management and customer interfaces. It has benefits for all parties on the sell-side and buy-side. For the manufacturer it provides competitive differentiation, deeper relationships with customers, enhanced customer satisfaction and a source of recurring revenue. For the customer, it provides more value for the money and lower cost of ownership across the full life cycle of the products and faster and better after-sales service and support.

Until now, adoption of servitization has been sluggish in the global maritime industry. While we have seen an astonishing influx of new shipboard electronics and automation systems over recent decades, the way these products are maintained, serviced and repaired aboard ships has remained largely unchanged.

This is because servicing products on ships sailing on global routes across 24 time zones presents unique challenges.

Shipboard personnel are generally not equipped nor trained to perform repairs at sea, and it is impractical to carry a large inventory of spare parts on ships. Hence, the burden is shifted to technical service facilities ashore to respond promptly with trained technicians equipped with the necessary spare parts to do the job. Commercial pressures mandate fast turnaround in port with a minimum of downtime.

Elcome technician with the HoloLens headpiece on a service job.

New Business Model for Shipboard Service

In this article, we will discuss the challenges and solutions for creating a more streamlined and integrated approach to shipboard service from the point of view of a global manufacturer of shipboard electronics and a major international service company.

First a few words about our two companies. Danelec Marine is a Danish manufacturer of marine electronics, including voyage data recorders (VDRs), electronic chart display and information systems (ECDIS) and Internet of Things (IoT) connectivity solutions. More than 6,000 ships today are equipped with a VDR or S-VDR designed and manufactured by Danelec. Elcome International is one of the world's largest independent marine service companies with headquarters in Dubai and service offices in 11 countries.

Before we turn to proposed solutions, let's briefly look at a typical service scenario: A critical item of navigation equipment experiences a failure at sea, and the crew is unable to get it back into operation. The master reports the problem to the shipowner or manager, who in turn contacts the shipping agent in the next port of call. The shipping agent arranges for a service call from the nearest authorized service provider as soon as the ship docks. The service technicians board the ship, either at anchor or pier-side. They conduct diagnostic routines to determine the problem. They may call the manufacturer's service department for guidance and advice. Once the problem is identified, they return ashore to fetch the needed tools and spares or a replacement unit if needed. Assuming the correct parts are available locally, they return to the ship, make the repairs, reinstall connections and cables, reload the operating system and software programs and test everything to make sure it is working properly. If the parts are not readily available, they must be ordered and shipped—usually by expensive airfreight. The process may take several days, resulting in costly downtime in port. Because many critical shipboard systems are mandated under international carriage requirements, the port state control authorities often will detain a ship in port until repairs are made satisfactorily. If the authorities grant a waiver and allow the ship to sail, the whole process will be repeated at the next port. Occasionally, the technicians may ride the ship to make repairs underway, flying back to their home office from the next port.

This process is inherently inefficient and unnecessarily expensive. So, how can it be improved? We'll start with the manufacturer.

Servitized Manufacturing

Traditionally, most marine manufacturing companies are organized around vertical "silos" such as product development, engineering, production, marketing, sales and service. The service department is usually not involved in the R&D or product development stage and is treated as a separate cost center.

When it came time for Danelec Marine to introduce its second-generation line of VDRs about five years ago, the management team saw a perfect opportunity to adopt a servitization strategy and initiated a top-to-bottom transformation encompassing all aspects of the business. This involved dissolving vertical silos and creating a company-wide involvement in the streamlining of service.

The first step was a total redesign of product architecture, introducing a completely new concept in marine electronics called SoftWare Advanced Protection (SWAP) in which all the VDR's system programming and configurations are contained on a hot-swappable memory card that plugs into the front panel of the unit. This simplifies and streamlines the service process aboard ship.

When boarding the ship, the service technicians can bring with them a replacement VDR processing unit. They extract the SWAP card and disconnect the old unit. Then they slide the replacement unit into the rack, reconnect the plugs and reinsert the memory card into the new unit. There is no need to reprogram the new unit or reinsert software programs. They are automatically downloaded into the new unit, and the VDR is fully functional as soon as it is switched on. The service call is completed in a matter of hours rather than days. The faulty unit is returned to a Danelec certified repair facility and, if possible, is returned into inventory. The SWAP functionality has now been incorporated into every product manufactured by Danelec.

The second step was a complete reorganization of the company's service organization, establishing new rigorous standards for service providers worldwide and creating standardized policies and practices. All third-party service technicians are given extensive training prior to becoming certified to perform product installations and the mandatory annual performance tests (APTs). Danelec upgraded and expanded the service network worldwide, augmenting service availability in more than 50 countries and established certified service centers, which are required to maintain a substantial inventory of replacement units and spares. Importantly, Danelec also set up an automatic feedback mechanism for service technicians. A report is automatically initiated for every service call. Danelec monitors and analyzes every installation and APT to ensure it conforms to quality standards, and a below-standard report triggers a requirement for remedial training for the technician.

The third step was the launch of an automated cloud-based eService platform that provides seamless integration of the ship service process by connecting the equipment manufacturer, the local service company and the ship manager. When a service call is initiated, the service company can log into the eService portal to retrieve information on the product's service history and be fully prepared with trained and certified technicians with the right tools and parts to make the repair quickly with minimum downtime for the ship. At the end of the service call, the technician can use the eService tool to perform an automated error check procedure and extract a data sample from the VDR. The Danelec team reviews the data as part of the quality-control procedure. If the vessel had more than one service call recently on the equipment, eService automatically initiates a red-flag alert, and a plan for solving the recurring problem is developed.

The next step, which is ongoing, is to integrate remote equipment monitoring into an IoT solution using a universal onboard server, which accepts and processes data inputs from all types of shipboard systems for transmission from ship to shore via a relatively inexpensive satellite connection. The Danelec-Connect platform allows for both "push-through" and "pull-through" of data sets from the VDR from shore offices. With this level of connectivity, the manufacturer, ship manager and service provider can have access to data from the shipboard equipment. This will give an early warning of a potential fault or failure and will yield useful inputs prior to initiating the service call.

Digitizing Service

Now let's consider the point of view of the service provider.

Elcome International is a good example of a large service organization. Founded 50 years ago in 1969, Elcome is based in Dubai and has service locations in United Arab Emirates, Egypt, Bahrain, Kuwait, Oman, Saudi Arabia, Sri Lanka, Singapore and Malaysia, as well as a subsidiary and associated companies in India. The Elcome Group has more than 500 employees, including more than 200 highly trained engineers and technicians, and maintains a spares inventory worth more than $15 million. Elcome is the authorized sales and

service representative for more than 60 major equipment manufacturers and offers a range of annual maintenance contracts that ensure service and spares availability at predictable costs. Elcome technicians make an average of 800-plus ship-service calls per month with a first-time fix rate of 96 percent. Additionally, Elcome is Southeast Asia's largest supplier of nautical charts and publications, both print and digital, and operates a training center and bridge simulator in Dubai.

In 2018, Elcome embarked on a major top-to-bottom modernization of its service business harnessing new disruptive technologies such as mixed reality, artificial intelligence (AI), holographic computing, cloud-based IoT, analytics, big data, collaborative databases and knowledge-based software tools. The goal was to provide greater transparency, improve efficiency, minimize errors, speed up repairs, reduce operational costs and minimize downtime for customers.

The new platform was developed for Elcome by Hitachi Solutions and built on Microsoft Dynamics 365 software, integrated with the Microsoft HoloLens wearable mixed-reality technology. The comprehensive solution uses cloud-based interconnectivity to automate and streamline all facets of managing shipboard service, including the initial service request, scheduling the service call, assigning the most appropriate available service engineer for the job, ensuring the proper service kit, performing and documenting the service job, logging man-hours, testing, recertifying and following up on the job.

A major part of the effort is the digitization of Elcome's massive paper-based service files, which contain hundreds of thousands of job reports dating back nearly 20 years, reflecting the average lifespan of a ship and installed equipment. The digitized files are being used to construct an easily accessible searchable library using big data and AI tools to provide insights in service history for equipment failures, repetitions, fault symptoms and remedies.

Elcome is also developing standard service kit packages, including tools, spares and documentation for the full range of products and manufacturers represented. These service kits can be customized as needed for each specific job.

The Microsoft HoloLens technology brings a totally new dimension to field service. A combination of virtual reality and holographic computing, the HoloLens headset gives the service technician hands-free access to vital data, including equipment history, service tips, diagnostics, schematic drawings and technical management, as well as remote face-to-face consultations with experts, all superimposed holographically in a 1:1 image over the real-world view. The built-in camera can also be used to document the service call and record the repair work in the job report.

The HoloLens headpieces are currently undergoing test and evaluation, with full system-wide deployment planned for 2019. The headsets will be deployed with Elcome technicians on all service calls as part of their

standard kit. Elcome will also make them available to all ships covered by annual service plans. This will enable the ships' crew to communicate with Elcome's service center to help diagnose the problem so the Elcome technicians can troubleshoot before initiating the service call. Elcome will preprogram the shipboard HoloLens units with virtual "sticky notes" for specific products and systems as reminders for the crew when performing onboard maintenance and troubleshooting problems. In many cases this may avoid a service call, and if shoreside service assistance is needed the technicians can prepare the proper service kit of parts and tools tailored for the job before boarding the ship.

Elcome is also digitizing its nautical charts and publications business, switching to digital products to reduce expensive inventory and improve response times for customer requests. For customers who still require paper charts, Elcome has invested in a print-on-demand system for faster response times, without need for manual corrections. Elcome's full-size digital printers produce charts directly from the UKHO ADMIRALTY cartographic database. The printed charts meet the highest cartographic quality standards and are fully up to date when printed. This has allowed Elcome to reduce the number of paper charts in stock from 6,000 to about 300 local charts.

Conclusion

For many years, there has been little change in the way shipboard equipment is maintained, serviced, up-

graded, repaired and replaced. That's starting to change, driven by initiatives such as the ones described above.

As servitization takes root in the maritime industry, manufacturers, third-party service representatives and ship managers will gain important benefits—in terms of faster and more efficient service, minimal downtime, lower life-cycle costs and—importantly—vastly improved customer satisfaction across the board.

This will become increasingly important as the maritime industry continues to move toward greater onboard automation. **ST**

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