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## in this issue



# Efficiencies through Targeted Interactions between the Parts and DMSMS Management Communities

by Jay Mandelbaum, Tina M. Patterson

### Introduction

Relax. Now imagine a perfect world where every program has the ability to minimize unanticipated negative cost and schedule impacts. How? Through the selection and proactive monitoring of the parts embedded in a system's design. Not possible? Well, stop imagining and see that there are, in fact, two communities that exist and should be leveraged to help DOD programs do just that. The communities are the parts management and diminishing manufacturing sources and material shortages (DMSMS) management.

What's that? You are not familiar with these two communities and their

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# Reliability Center Maintenance (RCM): An Essential Reliability Design Requirement

by Russell A. Vacante, Ph.D.

Getting back to reliability basics we need to consider the important role that Reliability Center Maintenance (RCM) plays to ensure designed-in system, or system of systems reliability requirements are met. That reliability is an integral part of the design should be a well instilled engineering approach to the life cycle management processes. Just as important to designing-in reliability requirements, RCM is to maintenance tasks in order to achieve inherit operational maintenance levels.

For a more comprehensive definition of RCM we can turn to Blanchard and Fabrycky, 5th edition publication entitled: "Systems Engineering and Analysis:" "Reliability-Centered Maintenance (RCM) is a systematic approach to developing a focused, effective, and cost-efficient preventative maintenance program and control plan for a system or product. This technique is best initiated during the early design process and evolves as the system is developed, produced, and deployed." Some important issues that can be extracted from this definition include the subjects of design, cost and supportability. To be cost efficient, RCM

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### Parts Management

The practice of considering the application, standardization, technology (new and aging), system reliability, maintainability, supportability, and cost in designing or selecting parts and addressing availability, logistics support, DMSMS, and legacy issues in supporting them throughout the life of systems.

**Source: SD-19, "Parts Management Guide," December 2013.**

### DMSMS Management

**A multidisciplinary process to:**

- Identify issues resulting from obsolescence, loss of manufacturing sources, or material shortages
- Assess the potential for negative impacts on schedule and/or readiness
- Analyze potential mitigation strategies
- Implement the most cost-effective strategy

**Source: Standardization Document (SD)-22, "Diminishing Manufacturing Sources and Material Shortages: A Guidebook of Best Practices for Implementing a Robust DMSMS Management Program," January 2015.**

management processes? Definitions for both can be found in the boxes on this page, but more important than definitions is what they can do for a program office and the development, production, and sustainment of its system.

Parts management benefits a system by ensuring that parts are selected for a system design to reduce its life cycle cost and logistics footprint.

DMSMS management benefits a system by identifying and resolving obsolescence issues before there is an opportunity for those issues to impact cost, schedule, and readiness.

However, an even bigger payoff in terms of weapon system affordability, supportability and logistics readiness can be attained when both of these communities perform effectively and in conjunction with one another. This article will explore the responsibilities of each of these communities throughout the life cycle, as well as a number of enabling activities that support these roles. With this information, program management should be able to gain an understanding of how these two communities should be used synergistically to help meet its program's cost, schedule, and readiness goals.

## Parts/DMSMS Management Roles and Responsibilities throughout the Program Life Cycle

To avoid confusion, in some (but not all) companies, the DMSMS and parts management functions are handled by a single organization. When that is the case, the differentiation between the two communities is somewhat artificial. Within DOD, however, the authors are unaware of any situa-

Prior class design and construction suffered from parts proliferation. The Trident class required 28,000 procured parts, the Los Angeles class called for 29,000 procured parts, and the Seawolf class lead ship construction required 45,000 procured parts. In contrast, the initial issue of drawings for the Virginia class called for 17,963 procured parts. Over the life of the Virginia class program, \$27M invested in parts standardization is projected to lead to \$789M in cost avoidance.

**Source: Defense Standardization Program Case Study: The Virginia Class Submarine Program, Defense Standardization Program Office, undated.**

The Virginia class program office established a technology refreshment integrated product team (IPT), formalized a standard operating procedure, developed a memorandum of agreement with the Naval Supply Systems Command for the advanced procurement of spares, and established a budget. As a result, the program has resolved more than 1,260 obsolescence issues and reaped more than \$159M in documented cost avoidance by being proactive since inception.

**Source: Standardization Document (SD)-22, "Diminishing Manufacturing Sources and Material Shortages: A Guidebook of Best Practices for Implementing a Robust DMSMS Management Program," January 2015.**

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SERVICE DISABLED VETERAN-OWNED SMALL BUSINESS tion in which the two functions are handled by the same community or organization. Consequently, the distinction between the relative roles and responsibilities is acute.

Parts/DMSMS management roles operate in parallel over the entire program life cycle. Acquisition programs benefit most when both parts management and DMSMS management begin early in the system life cycle. However, their respective roles and responsibilities, which at times are similar, do evolve over time (see exhibit, following page).

Carrying out these Individual roles and responsibilities improves program affordability. For example, take parts management. Avoiding new parts avoids costs. For each part, there is an average cost avoidance of $27,500 for not adding a new part into inventory (according to the SD-19). As a result of effective parts management, the Virginia class submarine program was able to significantly reduce the number of new parts introduced into the supply system (see box) relative to prior submarine programs.

From a DMSMS management perspective, the Virginia class submarine program initiated a robust, proactive program early in the design build process. While some DMSMS is evitable, carrying out its proactive roles and responsibilities leads to cost avoidance (see box) because the earlier a DMSMS issue is identified, the longer the window of opportunity to resolve it. But since a long window of opportunity generally allows for more low-cost resolution options, as compared to a short window of opportunity, more costs are avoided.

Closer working relationships between these two communities could increase their effectiveness. When the parts management community establishes part selection criteria, DMSMS considerations play a prominent role. After the engineering community tentatively selects parts (either for an initial design, a redesign to resolve an obsolescence issue, or another type of system modification), the DMSMS community should be given the new parts lists or bills of material (BOMs) or changes to existing parts lists or BOMs. DMSMS practitioners review the new parts for both current obsolescence and future obsolescence risk. If there is an issue serious enough that another part should be selected, the DMSMS community should work with the parts management community and ultimately with design engineering to identify an alternative.

Of course, there is a question of how well working relationships between these communities and designers actually work. The better the integration, the greater the benefit to program offices. The following section looks at some common enabling activities and raises questions about better interfaces between the two communities.

## Enabling Activities in Support of Roles and Responsibilities

### *Contract Language*

Both DMSMS and parts management guidance provide numerous best practices to help perform these roles and responsibilities. Both communities have established preferred contract language. In the case of parts management, contract requirements are contained in MIL-STD 3018. Although there is a requirement for proactive DMSMS management in MIL-STD-3018, additional requirements may be needed to ensure that best DMSMS management practices are performed (e.g., materials and chemicals, transfer plans, health reports, metrics, etc.). While the SD-22 contains some more expansive contract language examples, an effort is now underway to establish preferred contract requirements, corresponding contract language, and associated data item descriptions (DIDs) and contract data requirements lists (CDRLs). These two approaches to contract language have been pursued independently. *Would a joint approach to combine DMSMS and parts management contract requirements into fewer independent contract clauses be a good idea?*

### *Plans*

Plans that summarize key activities and are updated throughout the life cycle are an important aspect of both parts and DMSMS management. While the plans have a similar structure, there are important differences. The parts management plan described in the SD-19 is a tactical plan written by industry for industry. There is no parts management plan written by the government for the government, because the government does not design the system. The DMSMS management plan described

### TECHNOLOGY MATURATION AND RISK REDUCTION PHASE

#### *Parts Management Best Practices*

- Preliminary parts management plans should be developed
- Although parts management requirements for prototypes are not anticipated, architecture and technology decisions affect part selection
- All initial determinations and collaborations between the acquisition activity and the contractors concerning the parts management requirements as stated in MIL-STD-3018 (including the a requirement to establish procedures for obsolescence management) should be considered in the development of preliminary designs before Milestone B

#### *DMSMS Management Best Practices*

- The technology development contractors and their subcontractors along with the DOD program office in an oversight role should develop designs for prototypes that are resistant to DMSMS issues by employing DMSMS design considerations
- DMSMS management plans should be developed
- To the extent that part selection is done, the contractors should be required to deliver parts lists to the government
- All high-risk parts should be monitored for actual or pending DMSMS issues; results should be identified to the government program office; and plans should be developed to eliminate these parts as the design matures

### ENGINEERING AND MANUFACTURING DEVELOPMENT PHASE

#### *Parts Management Best Practices*

- Requirements as stated in MIL-STD-3018 should be implemented under an approved parts management plan
- Requirements should be flowed down to subcontractors, and the contractor should review their processes for approval
- As subcontractors come "on line," they should implement their approved parts management process

#### *DMSMS Management Best Practices*

- A prime contractor and its subcontractors along with the DOD program office in an oversight role should develop designs for prototypes that are resistant to DMSMS issues by employing DMSMS design considerations
- DMSMS management plans should be updated
- Contractors should be required to deliver bills of material (BOMs) to the government
- All high-risk parts should be monitored for actual or pending DMSMS issues; results should be identified to the government program office, and plans should be developed to replace these parts before production begins

### PRODUCTION AND DEPLOYMENT PHASE

#### *Parts Management Best Practices*

- Required for changes or modification to the baseline design, such as value engineering changes or parts obsolescence issue resolutions

#### *DMSMS Management Best Practices*

- A prime contractor and its subcontractors along with the DOD program office in an oversight role should develop designs resistant to DMSMS issues by employing DMSMS design considerations for new designs and engineering change proposals
- DMSMS management plans should be updated
- Contractors should be required to deliver updated bills of material (BOMs) to the government
- All high-risk parts should be monitored for actual or pending DMSMS issues; results should be identified to the government program office, and plans should be developed and funded to resolve DMSMS issues before production is impacted

### OPERATIONS AND SUPPORT PHASE

#### *Parts Management Best Practices*

- Required for changes or modification to the baseline design, such as value engineering changes or parts obsolescence issue resolutions

#### *DMSMS Management Best Practices*

- DMSMS management plans should be updated
- Contractors should be required to deliver BOMs for system changes and checking new designs for DMSMS resilience
- All high risk parts in the BOMs should be monitored for actual and pending DMSMS issues
- Monitoring should be conducted by support contractors and/or government program offices as a function of the life cycle support plan. When contractors are monitoring, actual and pending DMSMS issues should be identified to the government program office. The government program office overseas all contractor DMSMS management activities
- Plans should be developed and funded to resolve DMSMS issues before they impact the system

**EXHIBIT: PARALLEL ACTIVITIES OF PARTS MANAGEMENT AND DMSMS COMMUNITIES BY ACQUISITION PHASE**

in the SD-22 is written by the government for the government. It is generally more strategic than tactical, but individual program offices may tailor it to their needs. Industry's tactical DMSMS management plan is described in SAE 0016[1] and should be aligned with the government's plan. *Should there be closer integration among the plans?*

### *Teams*

Both communities carry out activities with a multidisciplinary team composed of people with similar functional expertise. Again, there are differences. The parts management team described in the SD-19 is an industry team. While there will be a government point of contact (POC), there is usually no formal parts management government team. The Virginia class program adopted a more aggressive parts management approach (see box).

The DMSMS management team described in the SD-22 is a government-led team that meets regularly, including industry participation to the extent required by the contract. Industry's internal DMSMS management team is not described in the SD-22; its structure may be similar to industry's parts management team. For the Virginia class submarine, the DMSMS management team was included in its technology refreshment integrated process team (see box).

There is, however, no direct interface between industry's parts management team and the government DMSMS management team. *How does the necessary communication take place?*

### *Systems Engineering Design Considerations*

**1** SAE Standard 0016, Standard for Preparing a DMSMS Management Plan, 1 August 2011.

DMSMS management and parts management are both system engineering design considerations. According to the Defense Acquisition Guidebook (DAG), parts management is a standardization design strategy available to program managers. Benefits of parts standardization include:

- Reducing the number of unique or specialized parts used in a system (or across systems)
- Reducing the logistics footprint
- Lowering life cycle costs

In addition, parts management can enhance the reliability of the system and mitigate part obsolescence due to DMSMS. For DMSMS, the DAG identifies practices that the program should consider to minimize DMSMS risk throughout the life cycle of the system:

- Avoid selecting technology and components that are near the end of their functional life
- During the design process, proactively assess the risk of parts obsolescence while selecting parts
- When feasible, use an Open Systems Architecture to enable technology insertion/refreshment more easily than with design-specific approaches
- Proactively monitor supplier bases to prevent designing in obsolescence

*How well do the design interfaces work? Could the communities be better integrated to increase their influence on the design?*

### *Supply Chain Integration*

Supply chain integration encompasses new product development, technology, procurement, strategic sourcing, quality, technical data, inventory and demand management, and supply chain risk management. In nearly every one of these elements, parts management concerns and DMSMS concerns are very closely related. DMSMS and parts management are key elements of supply chain integration; their contributions are quite similar in concept.

For example, for the technical data element of supply chain integration, parts management is concerned with using technical data to assure that the part can perform in a way that meets all requirements. DMSMS management is concerned with having sufficient technical data to allow for monitoring for obsolescence and resolving issues if an item can no longer be procured. For

The program established a Parts Standardization Board—more than two years before completion of the ship specifications—to identify, implement, and maintain a parts standardization program. The board, the gatekeeper of allowable parts, functions under the direction of program management and has members from the engineering, design, materials, planning, quality, and operations departments. A team leader reports directly to the program manager to ensure that standardization goals are maintained. In addition, the shipbuilder's president signed and supports the standardization policy and procedures. Finally, the shipbuilding specification directs the use of standard parts. The use of standard parts is tracked as a technical performance measure throughout design and construction.

**Source: Defense Standardization Program Case Study: The Virginia Class Submarine Program, Defense Standardization Program Office, undated**

The team identifies obsolescence issues affecting the Virginia class submarines before they impact ship construction and develops timely solutions. The team's approach has the following elements:

- Identify obsolescence issues early, using the Obsolescence Management Information System (OMIS™) or via vendor monitoring efforts
- Notify stakeholders that an issue has been identified
- Identify all systems affected
- Select a solution
- Execute the solution
- Measure and report results to ensure consistency and repeatability

**Source: Defense Standardization Program Case Study: Obsolescence Management for Virginia Class Submarines, Defense Standardization Program Office, undated**

the Virginia class submarine, the management of technical data was standardized (see box).

Proactive DMSMS management and robust parts management decrease supply chain risk. Robust supply chain integration reduces DMSMS risk. Again, some questions on efficiency can be raised. *Is there duplication of effort and sufficient communication at the tactical level? Are the interactions among headquarters offices sufficient? Are these subjects sufficiently addressed in policy and guidance?*

## Conclusions

DMSMS management and parts management are closely connected, as evidenced by the following:

- They complement each other throughout the life cycle
- They both require plans, operate in teams, and rely on contract language
- They reinforce each other as design considerations
- They both have strong connections to supply chain integration

There are however questions concerning the efficiency and effectiveness of those connections, as well as connections to other activities, especially design. Are there ways to improve how each is managed by better leveraging their synergies to answer the following?

- To what extent do the desired interactions of the two communities in program offices reflect reality?
- How can the program office teams, plans, and contract language be better integrated?
- Is there any duplication of effort or lack of communication that can be avoided in program offices?
- Can communication be improved at the headquarters level?
- Are changes needed to parts/DMSMS management policy, guidance, training, or outreach?

An important step has been taken to pursue the answers to these questions with the appointment of a single individual to lead both functions within the Defense Standardization Program Office (DSPO), reporting to the systems engineering office in the Office of the Secretary of Defense. According to Mr. Greg Saunders, the DSPO Director, this change "recognizes and acknowledges the close cooperation and interrelationships of DMSMS and Parts Management. A systems engineering approach integrates these two closely related programs bringing to life the well-worn phrase, 'the whole is greater than the sum of the parts.' Each program has made significant contributions in the past—putting them under the same OSD program lead is a logical next step that should produce even greater efficiencies for our weapon systems programs."

But by itself, this step is not sufficient. Program offices will only benefit if program leadership takes action to ensure that government and industry parts and DMSMS management practitioners not only do their job in a robust manner, but also have their recommendations given priority by other engineers and logisticians in the program office. ■

### About the Authors

**Jay Mandelbaum and Tina M. Patterson** are researchers at the Institute for Defense Analyses (IDA) in Alexandria, Virginia. They have

The user interface for more than 600 interactive electronic technical manuals is standardized, allowing sailors to work across multiple systems and ships within the class—a first for submarines. Also, standardized technical documentation, including all of the ship's drawings, is integrated with the supply-ordering process and with on-board training products.

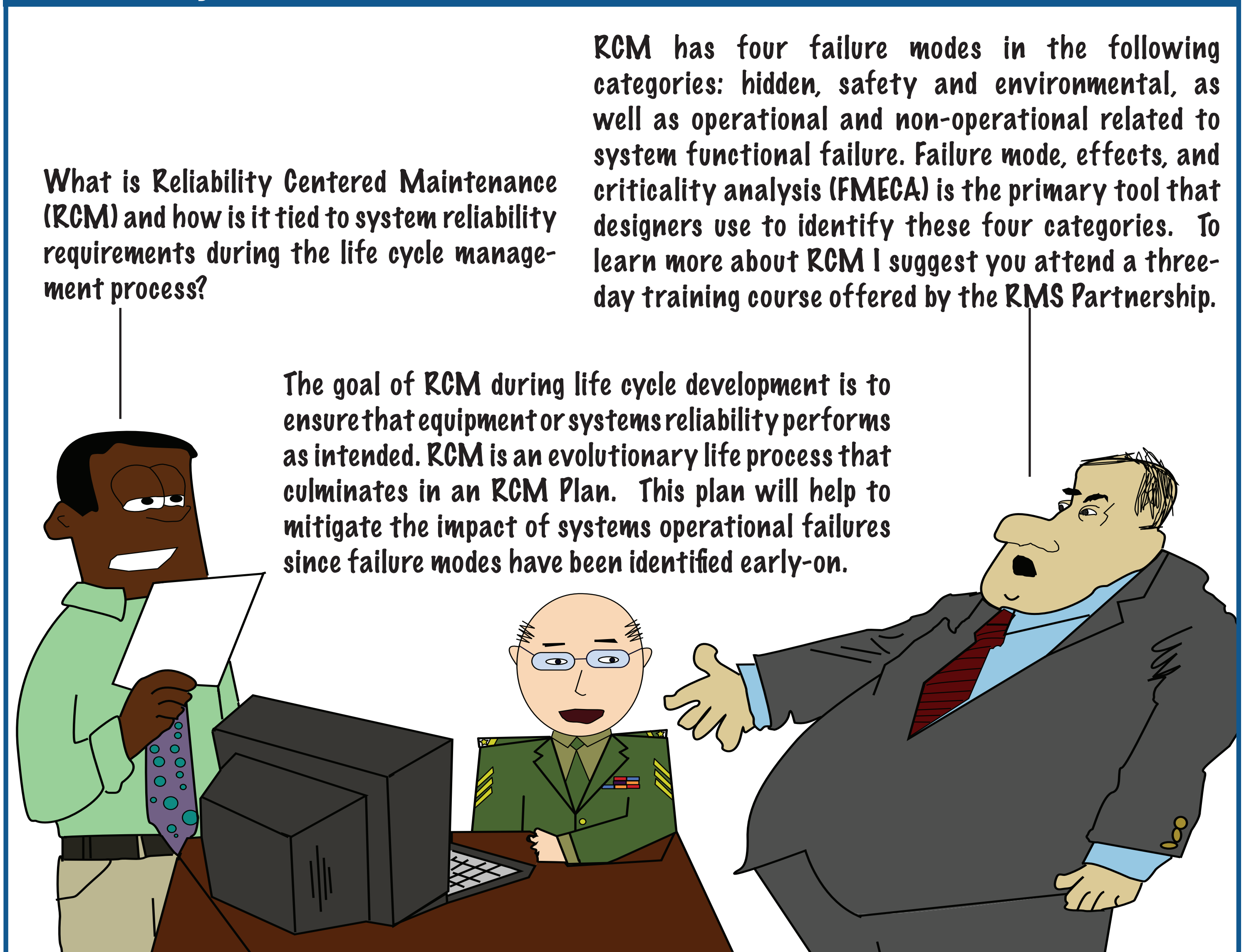
**Source: Defense Standardization Program Case Study: The Virginia Class Submarine Program, Defense Standardization Program Office, undated**

researched obsolescence policy, guidance and training during the last 7 years, and the best practices and other observations that they identified have been instrumental in working the agenda and outputs of both the Department of Defense (DoD) Defense Manufacturing Sources and Material Shortages (DMSMS) Working Group and Parts Standardization and Management Committee. Brown works in the Defense Standardization Program Office at Fort Belvoir, Virginia. She has been DoD's lead for DMSMS since May 2016 and Parts Management since January 2018. Prior to joining the DoD, she was the DMSMS lead at Naval Air Systems Command (NAVAIR) and provided DMSMS support to NAVAIR programs for 15 years.



## Another Day At The Office

by Russell A. Vacante, Ph.D.



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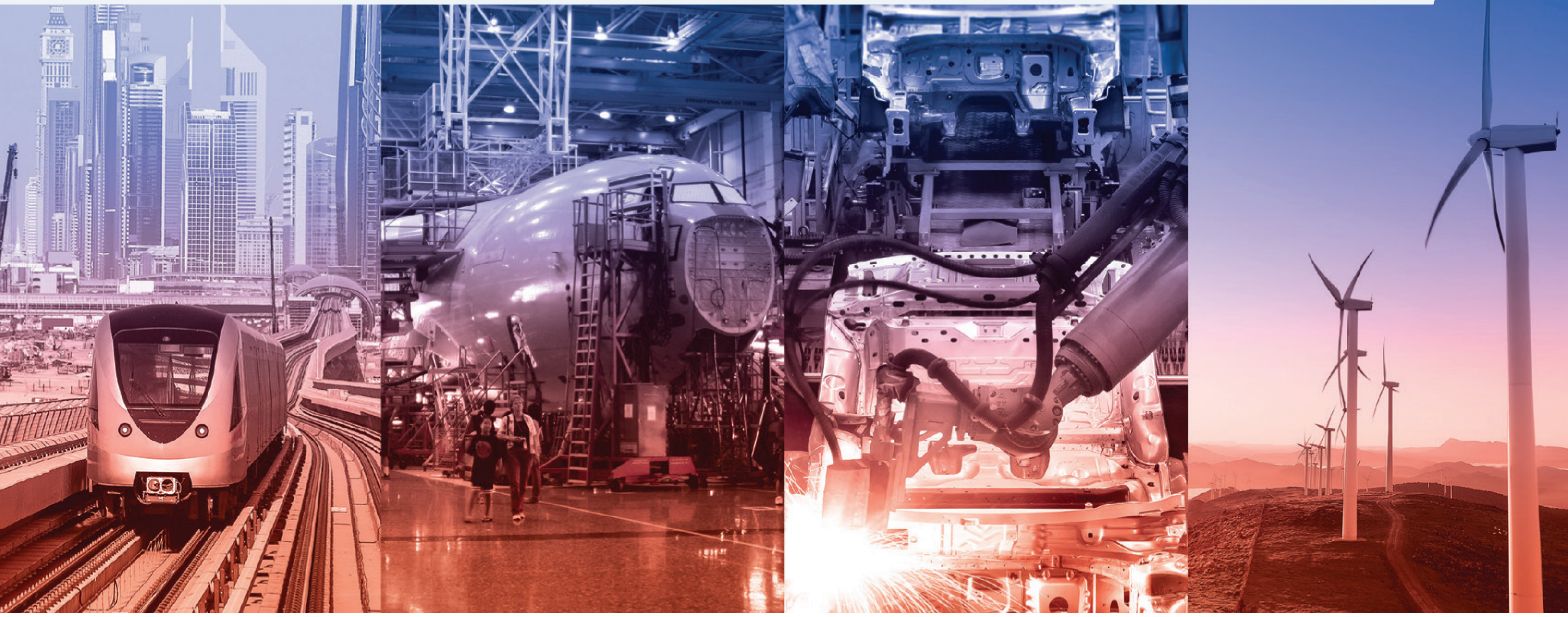

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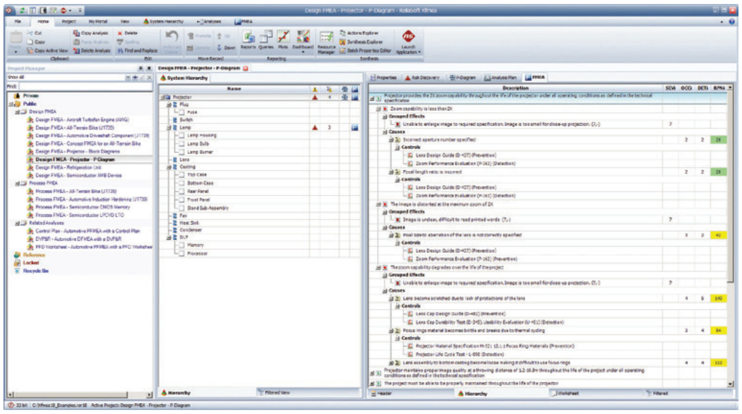

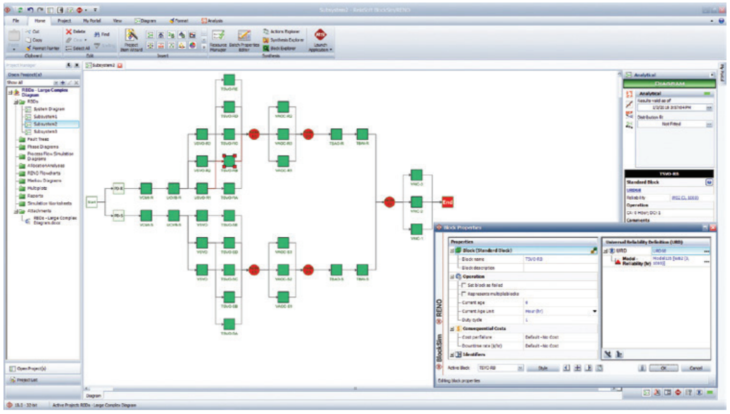

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# Reliability in the On-Demand World: Making it Better

by Gerard Ibarra

*On-demand* deliveries continue to grow given the wants and needs of people and businesses. On-demand is defined herein as items that must be picked up and delivered the same day within a specified time range, typically two to four hours for most items and food within thirty minutes from the time it is ready. This market continues to evolve with new and existing same-day delivery companies trying to make a footprint and service the needs of these new clients. The type of items delivered ranges from groceries to cooked meals, to on-line product orders and vehicle parts, to specimens and blood. Though this is not new, what is new are the players getting into the market and those that are innovating. They are pushing the thresholds of this sector and as a result give people and businesses more choices from technology related solutions to scheduling the time and day of the deliveries. These are game changers and will force those not keeping up with the competition out of business. Thus, with on-demand growing and companies trying to seize this opportunity, it is important for them not to forget and include the reliability of their service.

Reliability in its simplest term is performance over time. In this instance, how well did the company do with the pickup and delivery of an order over an extended period? If the company picks up and delivers X orders per month, were they all delivered in the right condition at the right time to the right person? To reduce the chances of a failure, companies must heed to the logistics of the delivery system. There are many ways to do this because of the morass of things involved in the delivery. They should at least consider the driver training, learning curve, order pickup and delivery, driver's app, dispatch software and delivery area to help maintain a high-level of reliability.

First, a company must think about the driver training given the type of deliveries they will make and for who they will make them. To deliver electronics, shoes, non-perishable office items for example is straight forward. You go to the pick-up, check the order against the items, collect the correct items and load them properly, and deliver them to the right company and person. However, even if it is this simple there are many things that could go wrong that affects the *turnaround time* (TAT), a key performance indicator that companies are measured against based on the order and delivery times. For example, the driver gets lost at the pickup or delivery location. Even though they know the address, they may have to go through a maze of buildings, offices and security to get there. They lose time trying to find where to park, what building to go to, access codes or telephone numbers to call for entry, what person to see to name a few. In an instance such as this, the company must have a standard operating plan (SOP) for this stop and make the drivers aware of what they must do. The SOP must be reviewed with the driver and easily accessible to them for reference. On the other hand, medical transports such as specimens are much different and require more training and a certification to transport them. Not just any driver can make the pickup. They must understand how to handle the specimens from ensuring they are properly packed and in the correct temperature state, to transported in a proper cooler or container and maintain the proper temperature for each specimen. If the driver picks up a frozen specimen and delivers it thawed, the chances are high it is compromised, and the test may be inconclusive. And everything about understanding the pickup or delivery location in the first scenario is more applicable here because the facilities the driver will go to are hospital systems and labs. It is much more difficult for someone to find their way around in such a facility. Proper training and SOPs are crucial to reduce the likelihood of a late or damaged delivery.

Next, is the learning curve. A company must consider the type of training and procedures they put in place to help obviate failures. If too complicated and riddled with a quandary of checks and double checks, it could take time before the driver becomes efficient. This could affect the TATs in that they could spend too much time at the pickup going through all the procedures causing precious time to elapse and thus makes the delivery late. The more impactful part of this is when drivers do not make enough money, they will not stay with the company. That is, since most drivers that do on-demand jobs work for companies as contractors, they typically get paid by the job. If they cannot do enough jobs in a day, that means they do not make the money they want and need. If this is the case, they stop contracting for the company and as a result the company must find someone new and train them again. This resets the learning curve and increases the chances of error. The driver must be there long enough to become skilled at what they do to lessen the likelihood of failures. The irony is with all the complicated procedures in place to reduce failures, it will take longer to get a driver skilled in pickup and deliveries, and if there is a high turnover rate, this perpetuates it further. To improve TATs and thus reliability, only put in place essential procedures and make it simpler to pick up and deliver. Creating too many processes could work against the company.

Another thing the company must consider are the instructions they give drivers for pickup and delivery. They must ensure they are pithy and precise. They must spell out to the driver what exactly to pick up and where to deliver. They should include a name, if not in violation with the Health Insurance Portability and Accountability Act (HIPPA), and description of the item. If possible, the client should place a bar code on the package and send that number to the company so when the driver picks up, they could scan the item to ensure they have the right thing. At the delivery, they should scan the bar code again to confirm they have the right item for the person or business. The company should also give the name of the person and their phone number. This way, if the delivery requires a signature and that person is not there, the driver could call and get instructions from them on what to do. Companies must ensure all the instructions and data needed for a pick up and delivery are effectively communicated to the driver. Keep it simple and to the point. Not doing so can cause late or missed pickups and deliveries.

Furthermore, the company should have a driver app that is intuitive and easy to use. The user experience (UX) is important as a great deal of data is exchanged between the company and driver. If the APP is difficult to use, the driver may not pick up the right things, go to the wrong location, or collect wrong or insufficient data to complete the order correctly. Drivers could spend more time getting trained on how to use the app than learning the SOPs of specific customers or being certified for medical transport. If the UX is difficult enough, the driver may enter the wrong data, or they could be forced to call the office and have a customer service representative (CSR) record the stop. This means the CSR will enter the data required by the customer such as the pickup and delivery times, item count, temperature of specimens, and name of the person who signed. Any time a human is manually transcribing data between different platforms, there are chances of an error. Another possible error is the driver calls ten minutes after the stop and forgets who signed, how many items they delivered, and the delivery time. To have accurate records, the company should have a driver app with an exceptional UX. Otherwise the faulty data could produce incorrect actionable processes or delivery times that ultimately affects the reliability of the service.

In addition, companies should consider investing into their dispatch software. Not having the software or the right one could make or break a company. If the company lacks highly-skilled and the right number of dispatchers, or dispatchers that are knowledgeable in the markets they serve, this could cause all types of failures. There are many nuances within markets that if the person dispatching does not recognize or have time to properly review and dispatch them, could negatively impact the TATs. For instance, a dispatcher not familiar with the market has an order in queue that they are not sure of the distance between the pickup and delivery. They also do not have time to look it up, and because of the fast-paced environment, gives the order to a driver nowhere close to the pickup and causes a late delivery. It could also affect the company in a bad way if they continue to grow through acquisition or landing major clients. The company is growing rapidly, and to get a dispatcher at a skill level where they can send jobs to drivers somewhat effectively, takes at least one week assuming they have done this before. In the meantime, TATs increase and reliability decreases. Therefore, having the right software can help the dispatcher make better and more informed decisions. It reduces the number they must make and frees up their time to focus on exceptions. It also cuts down the training time of the dispatcher. The software should have the ability to assign orders to drivers automatically for optimum TATs and let the dispatchers tweak them as they see fit. For instance, if the company has over 100 orders at a given hour, it is extremely difficult for the dispatcher to keep up with all the orders. That is, where is every driver, where are the orders in relationship to the pickup and delivery, and what time are they due. With the software, the dispatcher could focus on exceptions such as informing drivers of accidents or road closures, arranging for other drivers to pick up items from a driver that became immobilized, or calling the customers to let them know their delivery will be late due to this reason. Informing clients of late deliveries goes a long way with them and does provide somewhat of a reprieve on the TATs. Those that are in the logistics side know things happen beyond our control. However, to notify clients of late deliveries, companies need the right software to reduce the time a dispatcher spends assigning jobs or getting trained and lets them focus more on the exceptions.

Lastly, having drivers cover the entire Metropolitan Statistical Area (MSA) of a major city is challenging. It is possible to do, but it increases the learning curve. They must know the entire city, the ins and outs of congested areas, and have alternate routes in the event of accidents, inclement weather, and construction. Instead, the company should break up the city into say four zones with equal work. Drivers are then assigned based on the amount of work to specific zones. This reduces their learning curve since it reduces their coverage area. Instead of knowing all the nuances and idiosyncrasies of the MSA, they are reduced to knowing only one fourth of it. Now getting around, understanding the SOPs in this quadrant, and learning more about the repetitive clients, gives the driver a huge advantage. They are in tune with the area to the highest degree and as a result perform more effectively and thus improves reliability.

In short, the on-demand world is robust and continues to grow. The market conditions are right for people and businesses who want or need things immediately. This could be anything from shoes or books, to food or flowers, to specimens and blood. For companies that participate in this world, being reliable is a major key to success. Therefore, they should at least consider driver training, the learning curve, effective order communication, the driver's app, dispatch software and delivery area as part of their arsenal to maintain and increase reliability. ■

### About the Author

**Gerard Ibarra** is Vice President of Business Development for Dropoff Inc., a courier/logistics company that provides on-demand solutions for a myriad of companies from labs and hospitals, to department and grocery stores, to vehicle parts and legal documents. He has over thirty years of professional experience with the majority in logistics.

Prior to joining Dropoff, Gerard was President and CEO of Jaguar Logistics, the largest on-demand medical transport company in Texas. He was responsible for all facets of the business from the strategic growth to its acquisition.

Gerard's tenure includes working at United Parcel Service (UPS), cofounding and selling a technology company, providing logistics systems engineering consulting services and getting involved with the on-demand world. He has worked in various departments from Marketing, Sales and Operations, to Engineering and Consulting, and held multiple positions from Manager and Director, to Executive Vice President and CEO.

Gerard holds a PhD in Applied Science from Southern Methodist University (SMU) with emphasis in Systems Engineering and Logistics. He has taught graduate courses in logistics systems engineering at SMU's Bobby B. Lyle School of Engineering, and supply chain management and e-Business at the University of Dallas' Graduate School of Management. He also holds a B.S. in Electrical Engineering and M.S. in Systems Engineering from SMU.

Gerard enjoys spending time with his wife, working out, reading books, traveling, eating out, and going to the movies.

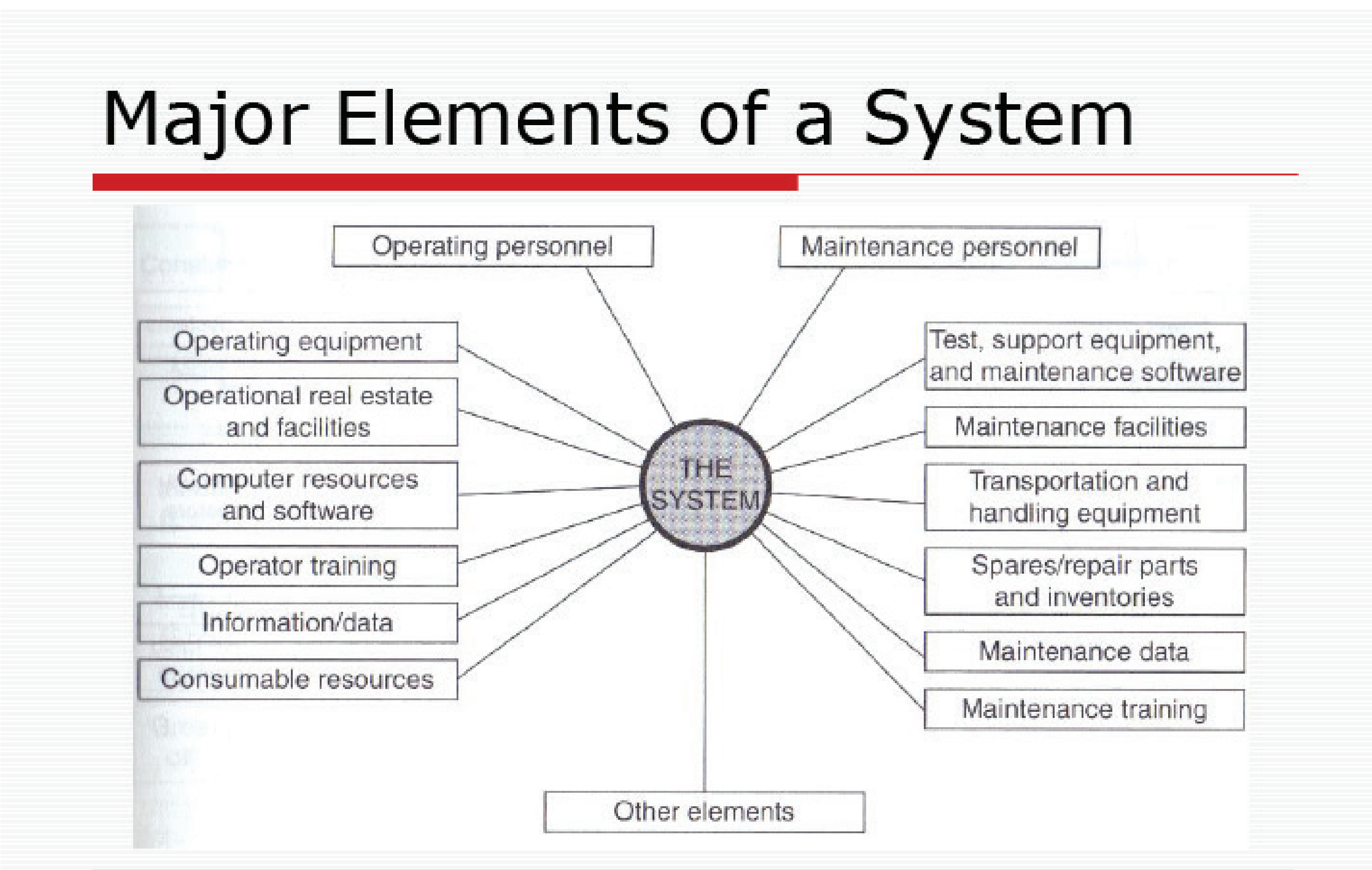
needs to be designed into a systems beginning at the concept exploration phase. Also, as RCM tasks are evolutionary, they are developed and refined throughout the life cycle. These evolutionary tasks can be categorized preventative maintenance decisions that result in robust preventative maintenance control plans for field systems. In this context it can be said that RCM determines the maintenance requirements to ensure operational system performance as intended. The RCM plan is a preventative failure document that helps to preserve system functionality. The RCM plan is an output that will help mitigate the impact of system operational failures since the design team has early-on identified failure modes and how to detect them.

The following chart displays the major elements of a system. The chart identifies numerous maintenance elements. However, we should not have the word "maintenance" in RCM narrow our perspective during the life cycle design process and in providing an RCM plan. Robust reliability requirements include addressing each of these system elements; maintainability, like reliability does not exist in a vacuum.

The RCM process places failure modes into four categories: hidden failures, safety, environmental, operational and non-operation consequences. A failure mode is said to be any event that results in a functional failure. Failure modes need to be identified in detail so that a failure mode strategy, and eventually a failure mode plan, can be implemented.

Failure mode, effects, and criticality analysis (FMECA) is an excellent design tool used in the development or assessment of a product/process to identify the four categories of failure mentioned above. It evaluates a system relative to possible failures, anticipated modes and expected frequency of failure to include cause, consequences, and the impact on the system. FMECA is used to identify areas of criticality where either redesign is required or scheduled items replacement are necessary to maintain operational reliability.

To reduce cost and system downtime the design team, from concept exploration to production, must endeavor to take steps to identify early-on maintenance issues related to



age-related failure, operator errors, schedule and rotation periods, cost factors to include restore or discard, mean-time between failures (MTBF), and the consequences of a failure in conjunction with a real-time monitoring scheme. These maintenance tasks are proactive measures to help ensure the reliability integrity of a system and to optimize operational performance and minimize downtime costs.

RCM may not be a foremost thought of the design team as they work to make reliability an integral part of the life cycle process. However, given that the goal of reliability is to predictably maintain performance over time, then it follows that RCM should designate critical reliability design tasks. RCM, when properly implemented, will help preserve the system by helping to identify specific failure modes that result in a loss of function.

To help promote the importance of RCM to the government-industry technical community the RMS Partnership is advocating taking of the following course:

*RMSP304: Reliability-Centered Maintenance. Reliability-centered maintenance, RCM, includes the application of the advancing body of knowledge for mission reliability, maintainability and availability to achieve life-cycle sustainability by making the transition from restoring system functionality through unscheduled repair maintenance (corrective maintenance) to preserving system functionality through scheduled maintenance (preventive maintenance). The implementation of RCM is achieved by following one of three paths: condition-based maintenance (CBM), time-directed maintenance (TDM), and stress-directed maintenance (SDM). Determination of the appropriate path is achieved by reliability failure analysis. Key concepts include: understanding the economic and safety benefits of RCM, the three paths of RCM and the method to determine the applicable path, and understanding how the organization's risk of failure enables determination of a cost optimum policy for part replacement.*

This is a three-day course that can be taken on-site both nationally and internationally. The same course can be taken online for a slightly extended period of time. For all those who are interested in achieving optimal system reliability and efficiency at a reasonable cost while minimizing the risk of operational failure, this course must be a high training priority. System and design engineers and logisticians, come one-come all, you, your organization and the user community of your systems will all benefit.

Organizations and individuals interested in making arrangements for the above training opportunity should contract me at president@rmspartnership.org or at Cell: 703-967-3025. ■

## Interested In Contributing?

**If you are interested in sharing your knowledge in future editions, please contact Russ Vacante at president@rmspartnership.org**

**Articles can range from one page to five pages and should be of general interest to our members.**